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A HANDBOOK

OF THE

THEORY AND PRACTICE OF MEDICINE.

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OF

MEDICINE.

BY

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THIRD EDITION.

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TO

SIR WILLIAM JENNER, BART.,

K.C.B., D.C.L., M.D., F.R.S.,

THIS WORK IS DEDICATED

AS A

TOKEN OF ESTEEM AND ADMIRATION, AND IN GRATEFUL
REMEMBRANCE OF MANY ACTS OF KINDNESS,

BY

THE AUTHOR.

PREFACE TO THIRD EDITION.

THE publication of this third edition in two volumes calls for a word of explanation. I desire at the outset to do away with the impression that this alteration has been made on account of any material enlargement of the work. The principal reasons which led to its being brought out in this form were, that, in accordance with a suggestion from various quarters, it would thus be made more convenient for perusal; and that I was enabled to proceed with the preparation of the two parts at the same time, and so to supply the demand for a new edition with as little delay as possible. The two volumes now issued contain but a small number of pages more than the single volume last published, and even this addition is mainly due to the introduction of illustrations, and to the fact that the whole of what was formerly in small type is now printed in the ordinary type. Some subjects have, however, been rather more fully discussed, and a few are now treated of in this work for the first time.

With reference to the illustrations, the short time at my disposal, in consequence of the speedy call for another edition, rendered it impossible for me to prepare more than a small number of original figures, and I have been compelled to copy the illustrations for the most part from various other works, which I gratefully acknowledge. I have endeavoured to select those which seemed most suitable for a treatise of this kind.

I have again to express my acknowledgments to many friends for suggestions or practical help, particularly to Dr. Mitchell Bruce and Dr. Milner Fothergill. My special thanks are also due to Dr. Creighton, who has permitted me to use his block of the figure illustrating "Primary Cancer." To Mr. John Tweedy I am once more indebted for revising the Chapter on Skin Diseases, which Dr. Tilbury Fox has also most kindly looked over and approved of.

I venture to hope that this work may still be found in its range of subjects equal to the requirements of those who are preparing for the medical profession, and that it may also continue to be of some service to those who are engaged in active practice.

THE AUTHOR.

53 Harley Street, W.
March, 1877.

CONTENTS OF VOLUME I.

SECTION I.

CHAPTER PAGE
I. Introduction—Objects and Method of Study 1
II. Ætiology or Causation of Disease 4
III. Symptomatology or Semiology—Mode of Invasion or Onset—Course and Duration—Varieties and Types—Complications and Sequelæ—Terminations—Method and Objects of Clinical Examination—Diagnosis—Prognosis 11
IV. Treatment or Therapeutics 22

SECTION II.

I. Hyperæmia or Congestion 25
II. Dropsy—Hydrops 29
III. Hæmorrhage 36
IV. Inflammation 42
V. Alterations in growth—Hypertrophy—Atrophy 57
VI. Degenerations—Fatty—Mineral or Calcareous—Fibroid—Pigmentary—Mucoid—Colloid—Albuminoid or Lardaceous Disease 62

SECTION III.

I. GENERAL DISEASES.

A. IDIOPATHIC FEVERS AND ALLIED DISEASES.

I. Fever or Pyrexia 76
II. On Contagion and Epidemics 91
III. On the Clinical Investigation of Acute Febrile Diseases—On the use of the Thermometer 103
IV. Simple Continued Fever—Febricula—Synocha 109
V. Typhus Fever 110
VI. Typhoid or Enteric Fever—Pythogenic Fever—Abdominal Typhus 119
VII. Relapsing Fever—Famine Fever 131
VIII. Scarlatina—Scarlet Fever 136
IX. Rubeola—Morbilli—Measles 143
X. Rötheln—Rubeola Notha—German Measles 147
XI. Variola—Small-pox 148
XII. Vaccinia—Cow-pox 159
XIII. Varicella—Chicken-pox 163
XIV. Erysipelas—The Rose—St. Anthony's Fire 164
XV. Diphtheria 169

CHAPTER PAGE
XVI. Mumps—Idiopathic Parotitis 177
XVII. Hooping-cough—Pertussis 179
XVIII. Influenza—Epidemic Catarrh 183
XIX. Epidemic or Asiatic Cholera—Cholera Morbus 186
XX. Glanders and Farcy—Equinia—Malignant Pustule 197
XXI. Hydrophobia—Rabies 200
XXII. Dengue—Dandy Fever—Break-bone Fever 202
XXIII. Pestis—Plague 203
XXIV. Yellow Fever 204
XXV. Cerebro-Spinal Fever—Epidemic Cerebro-Spinal Meningitis . 208
XXVI. Malarial or Paludal Fever—On Malaria or Marsh Miasm—Intermittent Fever or Ague—Remittent Fever . . . 210
XXVII. On the Diagnosis of Acute Specific Diseases 219

B. CONSTITUTIONAL DISEASES.

XXVIII. Rheumatism—Rheumatic Fever—Chronic Articular Rheumatism—Muscular and Tendinous Rheumatism or Myalgia—Gonorrhœal Rheumatism—Rheumatoid Arthritis 228
XXIX. Gout—Podagra 240
XXX. Scorbutus—Scurvy 249
XXXI. Purpura 252
XXXII. Rachitis—Rickets 255
XXXIII. Constitutional Syphilis 261
XXXIV. Tuberculosis—Scrofulosis 267
XXXV. Carcinoma—Cancer—Malignant Disease 274
XXXVI. Diabetes Mellitus—Glycosuria—Diabetes Insipidus . . . 280

II. LOCAL DISEASES.

I. Diseases of the Mouth, Tongue, and Salivary Glands—Stomatitis—Glossitis—Ulcers of the Mouth and Tongue—Symptomatic Parotitis or Parotid Bubo—Chronic Enlargement of the Parotid—Salivation or Ptyalism 288
II. Diseases of the Throat—Acute Inflammatory Affections—Ulcerations—Chronic Affections—Retro-pharyngeal Abscess . . 297
III. Diseases of the Œsophagus—Acute Œsophagitis—Chronic Diseases of the Œsophagus 309
IV. Diseases of the Respiratory Organs—Clinical Phenomena—Physical Examination—Of the Larynx and Trachea—Of the Chest 315
V. Dyspnœa—Apnœa—Cough—Hæmoptysis 345
VI. Diseases of the Larynx and Trachea—Acute Laryngitis and Tracheitis—Chronic Laryngitis or Laryngeal Catarrh—Ulcers of the Larynx—Morbid Growths—Œdema Glottidis—Laryngeal Perichondritis—Abscess—Necrosis of the Cartilages—Functional or Nervous Affections. 350
VII. Diseases of the Bronchi—Acute Catarrhal Bronchitis—Chronic Bronchial Catarrh—Plastic or Croupous Bronchitis—Dilatation of the Bronchi—Bronchiectasis. 366
VIII. Pulmonary Congestion—Œdema—Hæmorrhage . . . 377

CHAPTER PAGE
IX. Pneumonia or Inflammation of the Lungs—Acute Croupous Pneumonia—Catarrhal Pneumonia—Chronic or Interstitial Pneumonia 380
X. Gangrene of the Lungs 392
XI. Emphysema of the Lungs—Vesicular—Interlobular or Interstitial 394
XII. Asthma—Bronchial Asthma—Diaphragmatic Asthma . . 401
XIII. Atelectasis—Pulmonary Collapse and Compression . . . 406
XIV. Phthisis or Pulmonary Consumption—Acute Phthisis—Chronic Phthisis 409
XV. Cancer of the Lungs 428
XVI. Diseases of the Pleura—Pleurisy—Hydrothorax—Hæmothorax —Pneumothorax—Hydro-pneumothorax . . . 430
XVII. General Diagnosis of Affections of the Lungs and Pleuræ 441

LIST OF ILLUSTRATIONS.

VOLUME I.

FIG. PAGE

1. Amœboid Leucocytes 45
2. Pus-Corpuscles 48
3. Fatty Degeneration of Striped Muscles 62
4. Fatty Degeneration of Nerve-fibres 63
5. Liver-cells infiltrated with Oil 65
6. Cells in various stages of pigmentary infiltration 70
7. Cells undergoing colloid degeneration 71
8. Liver-cells infiltrated with amyloid matter 73
9. Gummy Growth of Liver 262
10. Elements from Grey Tubercle 268
11. Giant-cells 269
12. Cells from a Mammary Cancer 276
13. Primary Cancer of Rectum 276
14. Epithelial Carcinoma 277

THEORY AND PRACTICE OF MEDICINE.

SECTION I.

Chapter I.

INTRODUCTION.—OBJECTS AND METHODS OF STUDY.

In order to acquire a satisfactory knowledge of the Science and Art of Medicine, it is essential that the mental faculties should have been previously cultivated and trained, while at the same time the mind is stored with the requisite information, by a careful study of the fundamental and more scientific subjects which constitute the earlier portion of the medical curriculum. Above all is it necessary that the student should be thoroughly acquainted with the construction of the human body, and the normal composition, structure, and functions of its various fluids, tissues, and organs in health; in other words, with Anatomy and Physiology. Having this information, he will be very materially aided in his further progress, if, in the first place, he understands definitely what Medicine includes, and what he has got to learn; and secondly, if he sets about acquiring the requisite knowledge and skill according to a systematic, orderly, and scientific method.

It will be expedient at the outset to indicate the general scope of the study of Medicine, and to explain the meaning of its more comprehensive scientific terms which are in common use.

Disease.—The study of Medicine may be said to comprehend the study of *disease* in all its relationships. Under this term is included every deviation from the natural condition of the body or any portion of it, either as regards its structure, state of nutrition, or the due performance of its functions. It will be readily understood that there is no absolute line of demarcation between *health* and *disease*, these being merely relative terms. If a disease is associated with any evident structural change, it is said to be *organic;* if no such change can be detected by any method of investigation with which we are at present acquainted, it is called *functional.*

Disease requires to be studied from three main aspects, which may be considered under the heads of:—I. Pathology. II. Treatment or Therapeutics. III. Morbid or Pathological Anatomy and Histology.

I. Pathology. In its correct and comprehensive sense, *pathology* signifies that branch of Medicine which deals with and explains the origin and causes, clinical history, and nature of the several morbid conditions to which the human frame is liable. It is divided into:—1. *General pathology,* which treats of what is common to, or bears upon all or a number of diseases; and which comprehends certain very important subjects, such as congestion, hæmorrhage, inflammation, degenerations. 2. *Special pathology*, which is concerned with the various special and individual diseases. The word *pathology* has come to be frequently employed in a more restricted sense than that just indicated, viz., as signifying the explanation of the essential nature of morbid processes, of the characteristic changes accompanying the several diseases, and of the pathological causes of symptoms. According to its wider and more correct definition, it will be seen that pathology includes the two following:—

A. ÆTIOLOGY OR CAUSATION OF DISEASE, which treats of the causes of the various maladies, or the influences and agencies by which they are originated.

B. SYMPTOMATOLOGY OR SEMEIOLOGY. These terms comprehend the science which is concerned with all that pertains to morbid conditions, whether general or local, in their *clinical* relations, *i.e.* as they are represented in the living subject. It has to do therefore with:—1. Their CLINICAL HISTORY, including—*a. mode of onset* or *invasion; b. symptoms* or *clinical phenomena; c. course, duration*, and *modes of termination; d. varieties* and *types; e. complications* and *sequelæ*. 2. Their DIAGNOSIS, which signifies the recognition of the seat and nature of particular diseases, and their discrimination from other morbid states. 3. Their PROGNOSIS, or the judgment which is formed as to their future course and ultimate issue.

II. TREATMENT OR THERAPEUTICS.—This important branch of Medicine deals with the principles upon which the management of disease is conducted; and the measures which are employed with the view of preventing or curing the different maladies, of modifying their progress, or relieving their attendant symptoms.

III. MORBID OR PATHOLOGICAL ANATOMY and HISTOLOGY.—The structural and other recognizable changes which are associated with organic diseases come under this head, as revealed by *post-mortem* examination.

An useful and adequate knowledge of Medicine can only be built up by studying the subject in all the particulars just indicated. Before proceeding to study individual diseases, it is very desirable to have a comprehensive acquaintance with the main facts pertaining to general morbid processes, such as are grouped under *general pathology*. Further it is essential that all classes of diseases should receive due attention, and that the pathological and clinical relations of different organs and systems to each other should be known. It is a great mistake for the student to confine his observation to any one or more "specialties," even though he may intend ultimately only to practise such; at the same time there are some of the more special departments which at the present day deserve particular attention.

I proceed now to point out the plan according to which the Science and Art of Medicine can be learnt most easily and satisfactorily. First, a knowledge of its *theory* should be acquired, as taught in books, lectures, &c., in which such information and explanations are given with reference to principles and facts as can be conveyed in these various ways. Secondly, the *practice* of medicine must be learnt:—(i.) By personal observation and examination of actual cases of the several diseases, as exemplified in individual patients. (ii.) By proper attention to the different modes of *clinical instruction*, in connection with which allusion may be made to the great advantages to be derived from a thorough training in "case-taking," under competent supervision. (iii.) By the education of those external senses which are of constant service in the investigation of diseased conditions, and by repeated practice in the employment of the special instruments which are available for a similar purpose. (iv.) By the observation and study of morbid changes produced in the organs and tissues, as disclosed on *post-mortem* examination, the more minute alterations being ascertained by chemical and microscopic research.

All the methods of study just mentioned are important, though of course those of a practical kind are by far the more so, for anyone who relies on a mere theoretical knowledge of medicine is absolutely incompetent to enter upon its practice. Still this theoretical knowledge is not to be despised, seeing that it helps materially to clear the way for practical study, and saves a great waste of time and labour, for the student is enabled to comprehend far better what he observes, if he has mastered at least the elements of the subject, and the more information he possesses before beginning his practical work, the more likely is he to derive full and permanent benefit therefrom.

The usual fields for the study of illustrative cases of the several diseases are the wards of a hospital, and the different out-patient departments; each has its advantages and should be duly attended, the former affording illustrations of the acute or more serious chronic affections, the latter of the more common ailments met with in ordinary practice, and of the minor or more localized disorders not usually admitted into hospitals. If practicable, however, it is very desirable that patients should also be visited at their own homes, so that they may be seen surrounded by those conditions which form part of their experience in every-day life. There are certain diseases, moreover, a practical acquaintance with which is of the greatest consequence, which generally can only be studied in this way, viz., the majority of the *acute specific diseases*, which, with a few exceptions, are not admitted into general hospitals, on account of their infectious nature, and the opportunity is afforded only to a small number of observing them in the special hospitals set apart for these complaints. Though it is requisite, if possible, that examples of *all* forms of disease should be seen, however rarely they may be met with, yet those which are the more common, and which are likely to come frequently under notice in the course of practice, should receive the chief attention, and of these the student cannot observe too many cases, in order to become familiar with all the chief facts pertaining to them.

CHAPTER II.

ÆTIOLOGY OR CAUSATION OF DISEASE.

THIS is a subject of the utmost importance, and demands the most attentive consideration, for an adequate acquaintance with Ætiology is of great value in several respects. It often gives material aid in diagnosis; it not uncommonly throws a light upon prognosis, as the same morbid condition may differ much in its gravity according to its cause; in the majority of individual cases it affords most useful indications as regards treatment; and, above all, it enables the practitioner to adopt preventive measures against the development or extension of many diseases, and thus to preserve the health of the general community.

A knowledge of Ætiology implies not only a general knowledge of the causes which are capable of producing disease; but also a more particular acquaintance with the relation between special causes and special diseases, and, so far as this can be obtained, an intelligent comprehension of the manner in which the various influences produce their injurious effects.

It will be readily understood that the same cause may produce many and very different diseases, and *vice versa;* but with regard to the various classes of disorders, it will be found that each is brought about most commonly by a certain limited number of causes, which act more or less directly on the organ or part affected. This remark may be illustrated by the relation which exists between "taking cold" and lung-affections; between improper food or drink and derangements of the alimentary canal; or between excessive mental labour and brain diseases. Further, the particular causes which give rise to special affections of each organ are still more limited in their range. Some diseases can only be originated by one, definite, specific cause, and to such the term *specific* is applied.

Numerous terms have been employed to classify causes, often with much ambiguity of meaning. Only those which are practically useful will be alluded to here. The primary division generally made is into *proximate* and *remote.* The *proximate* cause is really the actual morbid condition of any organ or structure upon which the symptoms present depend, and it is synonymous with *pathological* cause. *Remote* causes are further divided into *predisposing* and *exciting*, some of the latter being named *determining*.

Predisposing causes include those influences which bring about a condition of the system generally, or of some organ or part, rendering it more prone to become the seat of disease. *Exciting* causes comprehend the immediate and direct agencies by which the different morbid changes are produced. The term *predisposition* is used to express the state favourable to the action of an exciting cause, and the individual in whom it exists is said to be *predisposed.* It is not to be supposed, however, that there is a distinct and definite limit between the two classes of causes above mentioned;

what may only predispose at one time may excite at another, and especially is this true when several deleterious influences act together and for a long period. Further, a so-called predisposing cause may only render one organ more liable to be attacked than another; for example, age exercises a marked influence as regards the seat of tubercle or cancer.

For the purpose of pointing out the more common causes of disease somewhat in detail, it will be convenient to classify them into:—1. *Intrinsic*, or those depending upon the individual, in whom they are *inherent* or *acquired*. 2. *Extrinsic*, or those due to accidental, and chiefly external influences. So far as this is practicable, an endeavour will be made to indicate which may be ranked as predisposing, and which as exciting causes.

1. INTRINSIC. *a. Age.*—A number of diseases are more prone to occur at certain periods of life than at others; while some morbid conditions tend to affect different organs at different ages, or even special tissues in the same organ. This may often be explained by the nutritive and functional activity of the system generally, or of certain organs, being much greater at one time of life than at another, and therefore the liability either to general or local disease is more marked. Changes of structure also, in the direction of decay, not unfrequently account for the predisposition due to age, as for example, degeneration of the vessels in advanced life rendering them brittle, and thus leading to cerebral hæmorrhage. Young children and persons advanced in years are very subject to ailments of various kinds.

b. Sex.—Females are more prone to certain affections than males, and *vice versa*, while some are necessarily limited to one or other sex. This depends on the difference in the conditions of certain organs in the two classes of persons, and in the length of outlets (*e.g.*, the urethra); on the functions peculiar to each sex; on the dissimilarity in habits, occupation, &c.; on the difference in constitutional strength and vigour; or on certain peculiarities in the nervous system, women being much more sensitive and excitable, and therefore more liable to various nervous disorders. The proportion of deaths is greater among males than females.

c. General or Constitutional Condition. State of Health, &c.—A state of debility, whether congenital or acquired, predisposes to many diseases. Possibly the opposite condition of robustness and vigour may increase the liability to others. The condition of the blood has also much influence, plethoric or anæmic individuals being predisposed to many complaints. Previous diseases, especially of an acute nature, frequently predispose to or excite others, *e.g.*, the various fevers, hooping-cough, lung-affections, rheumatism, and syphilis. Certain symptoms, such as cough, particularly if neglected, may be productive of serious mischief. Habitual neglect in attending to the natural functions, especially those connected with the alimentary canal, very commonly leads to injurious results. The existence of morbid changes in organs or tissues may readily induce or predispose to further lesions in them, or may give rise to diseased conditions in other parts. Thus a fatty or calcified state of the arteries renders them liable to be easily ruptured; cardiac diseases often excite lung-affections, and *vice versa;* or one disease of the lung or heart may originate another. Other causes of disease which may be alluded to under this head are direct loss of blood; excessive or long-continued discharges: and the sudden suppression of an habitual discharge, of a chronic skin-disease, or of some local development of a constitutional disorder, such as gout.

d. Temperament.—Four principal temperaments are described, viz., the *sanguineous*, *lymphatic*, *bilious*, and *nervous*, and each is supposed to indicate a susceptibility to certain particular diseases, though the information on this matter is very contradictory. Speaking generally, the *sanguineous* temperament is believed to predispose to fevers of a sthenic type, active congestion or hæmorrhage, and acute inflammations; the *lymphatic* to passive congestions, dropsies, low inflammations, and certain constitutional affections; the *nervous* to various disorders of the nervous system; and the *bilious* to digestive and hepatic derangements.

e. Idiosyncrasy.—Some individuals are affected injuriously by certain agencies, which do not at all influence others in the same way; this is the case with articles of diet, as fish or mushrooms; or medicines, such as iodide of potassium or quinine. To this individual peculiarity the term "idiosyncrasy" is applied, and it probably has an influence in predisposing to some diseases.

f. Hereditary predisposition.—Several diseases are supposed to be capable of transmission from parent to offspring, and with regard to some of them this is unquestionably true, but the evidence is by no means so clear or reliable with respect to others. It must be borne in mind that members of different generations may be exposed to the same extrinsic causes of disease, and this may account for the fact that certain affections seem to run through families. Those maladies or general morbid conditions usually considered to be hereditary, are:—

(i.) Certain constitutional or blood diseases, viz., gout, rheumatism, diabetes, scrofula, tuberculosis, cancer, syphilis.

(ii.) Some affections of the nervous system, viz., epilepsy, chorea, insanity, hypochondriasis, neuralgia, apoplexy, paralysis.

(iii.) Physical deformities, as well as deficiencies in connection with the special senses, such as blindness or deafness.

(iv.) Early degenerations, either local or general, which are evidenced by degeneration of the vessels, fatty changes in organs, loss of the elasticity of the skin, premature greyness or baldness, loss of teeth, and other signs of decay.

(v.) Some skin diseases, especially psoriasis and lepra.

(vi.) Emphysema and asthma (?).

(vii.) Gravel and urinary calculus.

(viii.) Hæmorrhoids (?).

The morbid conditions observed in different generations need not be identical, but may be merely allied in their nature. This particularly applies to the nervous diseases above mentioned, and to the degenerations. For instance, there may be epilepsy in one generation and insanity in the next. Again, some vicious habit in the parent may lead to disease in the offspring, *e.g.*, intemperance may undoubtedly originate certain nervous disorders. In some cases a constitutional disease in the parent, such as syphilis, may only cause the offspring to be weakly and delicate.

The transmitted disease may be actually developed in the fœtus in utero, being then termed *congenital*; it may appear spontaneously at some period or other after birth; or it may lie dormant until brought out by an exciting cause. In some cases it is supposed to pass over one generation and appear in the next, this being called "Atavism."

Hereditary tendency to disease is unquestionably intensified by intermarriage of those suffering from the same affection, *e.g.*, phthisis; and also by the marriage of those who are closely related, very young, or of very unequal ages.

The hereditary character of diseases is sometimes revealed by their development at an earlier age than is usual, of which gout is an instance. Families occasionally seem remarkably prone to be attacked by certain affections, and to have them with great severity, of which the infectious fevers afford illustrations.

g. *Race.*—There can be no doubt about the influence of race in increasing the liability to certain diseases or *vice versa.* This is exemplified in the greater proneness of white than black people to suffer from malarial fevers. The prevalence of some diseases, however, among particular races may be explained by their habits, mode of living, and place of abode.

2. Extrinsic. *a*. *Causes depending on surrounding conditions.*

(i.) *Atmosphere.*—The air breathed must necessarily influence greatly the state of health, and it does so in the following ways. It may be impure, because it is not sufficiently changed by proper ventilation, and therefore contains an undue amount of the products of respiration and combustion. Or it may be mixed with gases not usually present, such as those which emanate from sewers or decomposing animal or vegetable matters, or those which are given off in connection with manufactories. Suspended impurities are also often present *e.g.*, dust, cotton, hair, wool, unconsumed carbon, fragments of metals, arsenic, and, probably, living organisms. The atmosphere is frequently the vehicle for the transmission of specific poisons. The degree of moisture of the air is highly important, excess or deficiency in this respect often producing very injurious consequences. Possibly its electrical condition, or the amount of ozone in it, may have some influence. And, lastly, the degree of pressure of the atmosphere certainly affects the health, of which we have a familiar illustration in the results which sometimes follow the ascent of a high mountain. Atmospheric influences may act either as predisposing or exciting causes of disease.

(ii.) *Temperature.*—Excessive or long-continued heat or cold, whether acting upon the general system or applied locally, is most injurious. A sudden change from one extreme to the other often causes serious mischief, and so does exposure to cold winds. Even in warm weather a "chill" may give rise to disease, and this is frequently due to the patient's own carelessness, for instance neglecting to change wet clothes, or being exposed to a draught when heated and perspiring.

(iii.) *Amount of light and insolation.*—Those who reside or spend a considerable part of their time where little or no sun-light enters, are unquestionably below par as regards health. The amount and kind of artificial light employed has also some influence in the causation of disease.

(iv.) *Soil.*—The chief modes in which the soil exercises its influence are by the amount of vegetable matter which it contains susceptible of decomposition; by its degree of, and permeability to moisture; by its effect on the heat and light of the sun, whether absorptive or reflective; and by its chemical composition, which affects that of the water and air in the neighbourhood. Wherever there is an accumulation of vegetable substances, with sufficient moisture and a certain temperature, as is the case in marshy districts, malarial affections are almost always prevalent. Clayey soils are very moist and cold. Most sandy and gravelly soils are healthy, unless they contain vegetable matter. Those in which there is a large proportion of lime and magnesia are believed to originate goitre and renal calculus. The breaking up of soil is often attended with evil consequences.

(v.) *Sewage.*—This is a very common source of disease, both on account of the deleterious gases given off from it, and the decomposing organic matter of which it consists. In certain cases it contains specific agents in the causation of disease, and promotes their development or renders them more virulent. Sewage materials or the gases which emanate from them are particularly hurtful when mixed with water which is used for drinking purposes.

b. Causes due to the social condition and habits of the individual, and certain other accidental influences.

(i.) *Food.*—This may be deficient in quantity or of improper quality, either habitually or only temporarily, and may thus promote or induce disease, especially in children. On the other hand the diet may be excessive or too rich in quality. Irregularity as regards meals, the habit of bolting food, or insufficient mastication from any cause, are often very injurious.

(ii.) *Drink.*—Intemperance in the use of *alcoholic stimulants* is a fertile source of disease, and it is always well to bear this in mind when investigating any doubtful case. Spirits do most harm, especially if taken at frequent intervals, strong or only slightly diluted, and on an empty stomach. It must be borne in mind also that many of the compounds sold as beer, spirits, &c., contain highly noxious adulterations. Water or the want of it is a very prolific source of disease. When this element is insufficiently supplied for cleanliness and other purposes, serious results often ensue. The habit of drinking large quantities of water, especially during meals, frequently does harm. Again, water may be the direct means of conveying various morbific agents into the system, such as noxious gases, certain salts, poisonous metals, the ova of worms, animal organic matters, particularly those contained in the excretions, vegetable matters in a state of decomposition, and specific poisons. Tea-drinking in excess is a common cause of troublesome symptoms, and its injurious effects are seen daily in all classes of society. Milk does harm if decomposed or adulterated, and it has been proved to be not unfrequently the medium by which specific poisons enter the system.

(iii.) Certain *habits*, such as smoking or snuff-taking in excess; the use of narcotics, especially opium; or excessive indulgence in hot condiments, not uncommonly injure the health seriously.

(iv.) *Clothing.*—This may be insufficient, either habitually or only from time to time; or certain regions may be inadequately protected. Thus infants and young children are frequently completely exposed about the lower part of the body, and no doubt "take cold" as a consequence. The chest is also in many persons insufficiently covered. On the other hand individuals are not uncommonly over-clad, especially children. Clothing may also do harm by being too tight and exerting pressure, as in the case of those who wear tight stays or belts. The habit of neglecting to change clothes when they are wet is very dangerous.

(v.) *Want of cleanliness*, domestic or personal, often induces disease. Cutaneous affections may arise from the repeated contact with the skin of various substances of an irritating character.

(vi.) *Amount of labour and exercise.*—Many persons suffer as the result of excessive and prolonged labour, whether carried on habitually or only at intervals. On the contrary, others are injured by leading a sedentary life and taking no exercise. Various occupations furnish instances of both these hygienic errors, though they are often voluntarily indulged in apart from occupation, especially the leading of a sedentary existence.

(vii.) *Mental causes.*—Among these may be specially mentioned excessive intellectual effort or study, particularly if combined with deficient sleep or much anxiety; and all violent or depressing emotions, such as grief, sudden joy, deep anxiety of mind, or severe and sudden fright. They may either predispose to or excite diseases, especially those connected with the nervous system.

(viii.) *Mechanical causes.*—These constitute a very important class, especially in exciting or determining some morbid condition, owing to the direct injury or irritation which they produce. They chiefly include external violence, long-continued pressure, excessive use of a part, over-exertion and straining, prolonged maintenance of a fixed position, and the irritation of foreign bodies. Among the last may be particularly mentioned calculi, accumulations of fæces, parasitic animals and plants, and particles inhaled into the respiratory organs. Occupations often act injuriously in one or more of these ways. A mechanical cause sometimes leads to the local development of a constitutional disease; thus pressure or injury may determine the formation of cancer in a particular organ.

(ix.) *Causes connected with the sexual functions.*—Venereal excesses, masturbation, and too early or frequent sexual excitement, unquestionably often give rise to serious mischief.

The elementary causes which have thus far been considered are usually more or less combined in any individual case. On an extensive scale their influence is evident in the diversities which are observed as to the general state of health, and as to the diseases which prevail in civilized and uncivilized countries; in different nations, and in the same country under varying modifications of government, civilization, religion, &c; in large towns and country places, as well as in different towns or districts and in different parts of these; and in mountainous regions and low confined valleys. Some of them also explain the influence which *climate*, *season*, *occupation*, and other so-called causes of disease exercise upon the general health, and upon the development of many special complaints.

SPECIAL CAUSES OF DISEASE.—There are certain agents which excite disease not yet considered, and which require separate notice. They are chiefly of the nature of poisons of various kinds, and produce effects which are more or less definite and constant.

1. *Chemical poisonous substances, chiefly inorganic.* The effects of various chemical poisons upon the system are sufficiently obvious, and require no comment. It is necessary, however, to call special attention to the fact that some of these may gain an entrance into the system in connection with the occupation of an individual or in some other way, and without being directly administered as poisons or medicines. This is seen in the deleterious effects, local or general, which are produced by lead, mercury, phosphorus, arsenic, copper, gold, and other substances. With respect to arsenic, it is important to observe that one of its compounds may be given off as a fine powder from certain green papers used for papering rooms, and afterwards inhaled along with the atmosphere in which it floats, thus giving rise to symptoms of poisoning.

2. *Causes originating in the vegetable kingdom.*—(i.) Many of the ordinary poisons are derived from this source, such as opium. (ii.) *Parasitic plants* growing in various structures of the body are frequent causes of disease, especially of skin-affections. The presence of certain fungi *(sarcinæ)* in the stomach is supposed occasionally to excite vomiting. (iii.) *Decomposing vegetable matter* often does much harm. It is particularly injurious by producing *malarial* or *miasmatic poisons* so prevalent in marshy districts. These give rise mainly to ague and remittent fevers, but also to certain nervous disorders and other complaints. This subject will be discussed in detail in a later portion of this work. (iv.) It is believed by many that *contagion* is due to low vegetable organisms.

3. *Causes originating in the animal kingdom.*—(i.) Certain animals are venomous and are capable of inflicting poisoned wounds, *e.g.*, serpents. (ii.) Some animals are poisonous if taken internally, such as cantharides. (iii.) *Parasites* derived from the animal kingdom very commonly set up morbid conditions. The various intestinal worms, and the external parasites which infest the skin afford illustrations. (iv.) *Specific contagious poisons.*—A number of very important diseases originate from the entrance into the system of certain specific poisons, which are transmitted from some other animal to man, or from one human being to another, *e.g.*, hydro-

phobia, small-pox, scarlatina, syphilis. These will call for special and detailed consideration hereafter.

4. *Causes originating within the system.*—Some morbid conditions are due to the presence of a poison in the blood, which has been generated within the body as the result of perversion of the functions of digestion, assimilation, and nutrition. Gout furnishes an illustration, and once developed the malady may be hereditarily transmitted.

CHAPTER III.

SYMPTOMATOLOGY OR SEMEIOLOGY.

A SYMPTOM may be defined as any phenomenon which in the living subject gives evidence of the existence of a diseased condition. It is necessary to explain certain terms which are usually employed to indicate the nature of symptoms. 1. *General or constitutional* and *Local.*—These imply respectively that the symptoms are referred to the entire system; or only to some particular part. 2. *Objective* and *Subjective.*—The former include all phenomena which are evident to the senses of the observer, *e.g.*, redness or swelling; the latter those which are only subjectively felt by the patient, *e.g.*, pain or numbness. 3. *Direct or idiopathic* and *Indirect.*—These terms signify respectively, symptoms which are immediately associated with the diseased part; and those connected with some part remote from the seat of mischief, the latter in some cases being called *sympathetic.* Thus vomiting is often present as a sympathetic symptom during the passage of a renal calculus 4. *Premonitory* or *Precursory.*—Before the actual development of a disease, symptoms may be present indicating more or less clearly what is about to happen, and to such the above terms are applied. 5. *Diagnostic, Prognostic,* and *Therapeutic.*—These words sufficiently explain their several meanings, viz., as representing those symptoms which indicate the nature of a disease, its prognosis, or its treatment. *Pathognomonic* is the term applied to such symptoms as belong to one particular disease and no other, which are therefore absolutely characteristic of this affection. Much confusion has arisen in the use of the word *sign.* Frequently it is employed as synonymous with *symptom,* but this is incorrect, for a *sign* really means a symptom which points to the nature of a disease; in short, it is a *diagnostic* or *pathognomonic* symptom. *Physical signs* strictly speaking include all *objective symptoms,* though only such of these as are elicited by certain special methods of *physical examination* are recognized by some as *physical signs.*

In the majority of cases a number of symptoms are grouped together, general and local, subjective and objective, but sometimes one becomes so prominent as to be popularly looked upon as the disease itself, while it gives the main indication for treatment *e.g.*, dropsy, jaundice, or hæmorrhage. Under such circumstances, however, it is imperative that the actual pathological cause of the phenomenon should be carefully sought for, and the nature of the symptoms often affords a useful hint as to the direction in which this inquiry should be conducted.

It is very desirable that a knowledge should be acquired of the *clinical phenomena* which pertain to each organ or system of the body, before the study of its individual diseases is entered upon. In the subsequent chapters, therefore, the description of the diseases of the several organs will be preceded by an outline of the symptoms and signs which have to be looked for as evidences of their being in a morbid condition.

Having offered these general observations, it will now be expedient to consider briefly each of the more important points which pertain to the symptomatology of disease.

I. MODE OF INVASION OR ONSET, COURSE, and DURATION.

The varieties which may be met with in these particulars are as follows:—1. The invasion of an illness may be quite *sudden*, as often happens in the case of apoplexy, syncope, and many forms of hæmorrhage, the subsequent course necessarily differing in different instances, a rapidly fatal termination being not uncommon. 2. Frequently a disease is *acute*, coming on rapidly, though often preceded by premonitory symptoms; being severe in its character; and of brief or limited duration. Many acute affections run a tolerably definite course ordinarily; for instance, the eruptive fevers and pneumonia; but irregularities are frequently observed, owing to disturbing influences, and many diseases exhibit distinct *varieties* in their progress. When the onset is less rapid and the symptoms are less intense, the illness is said to be *sub-acute*. 3. The great majority of complaints are *chronic*, the symptoms setting in gradually and not being severe, while the progress is slow and protracted. A chronic disease may, however, be the sequel of an acute attack, or such an attack is often the cause of a fatal termination in chronic cases. 4. Some diseases are characterised by *periodical* exacerbations, which come on at regular or irregular intervals, the patient being comparatively or even quite well in the meantime. Such complaints are chronic in their progress, but acute or sudden as regards the onset and intensity of the attacks, having a remittent or an intermittent course. Epilepsy, ague, and asthma will serve as illustrations.

II. VARIETIES and TYPES.

Many diseases are liable to present more or less evident deviations from their ordinary clinical course, and these in some instances are so distinct and characteristic as to be termed *varieties*. A few diseases exhibit well-marked *types*.

III. COMPLICATIONS and SEQUELÆ.

Complications include such morbid conditions as are liable to arise during the course of a disease, but which do not usually form part of its clinical history. They may be due to the same cause; or be the direct result of the primary affection; or arise as accidental and independent events. *Sequelæ* are those morbid states which remain after, or are developed subsequent to the apparent cure of various affections. Complications and sequelæ are particularly observed in connection with acute diseases, such as fevers. It is very necessary to be familiar with those which are liable to arise in the several disorders, in order to be prepared for them, and to take measures with the view of preventing their occurrence.

IV. TERMINATIONS.

In a clinical point of view a case may terminate in—1. *Complete recovery*, which is usually gradual, the patient passing through a period of convalescence of longer or shorter duration, but may be sudden or very rapid. 2. *Incomplete recovery*, either a condition of impaired general health remaining, or some organ or part being permanently altered in its structure and functions; in fact a more or less *chronic* state of disease remaining behind. 3. *Death.*—This event may take place suddenly, rapidly, or slowly. As a rule it is a complex process, the functions of all the chief vital organs being more or less involved; but often the signs of approaching dissolution are associated more especially either with the *heart*, *respiratory organs*, or *brain*. Death beginning at the heart is said to be by *syncope,* and it may be due either to a want of a proper supply of blood to the heart—*anæmia*; or to a loss of contractile power in this organ, from mechanical interference with its action, structural changes in its walls, or disturbance in connection with its nerves, —*asthenia*. In some instances, such as starvation, these two modes of death are combined. Death commencing at the lungs is said to be by *suffocation* or *asphyxia*. This may depend upon the air inspired being unfit to aërate the blood, or, for various reasons, not entering the lungs in sufficient quantity—*apnœa*; or upon a stoppage of the flow of blood through these organs, as happens when a clot suddenly obstructs the pulmonary artery. Death beginning at the brain is said to be by *coma*, being characterized by a primary state of stupor or insensibility, which, however, is soon followed by interference with the respiratory and circulatory functions. These modes of death are merely mentioned at present, as their characteristic phenomena will demand a full description when treating of the diseases of the several organs.

V. ON THE METHOD AND OBJECTS OF CLINICAL EXAMINATION.

It is extremely important that the practitioner of medicine should be thoroughly conversant with the mode of conducting the clinical examination of patients, and that he should be able to carry this out in an intelligent and systematic manner. In order to acquire this ability, the student should realize that he needs considerable training and practice in "case-taking," a mode of clinical instruction to which he ought to devote earnest and diligent attention, taking notes of a variety of cases, and writing commentaries upon them. It is very desirable that some definite plan of procedure in this investigation should be adopted and impressed firmly upon the memory, so that it may be followed without effort on the part of the observer. The plans recommended by various writers differ only in minor details, and that of which I now propose to give an outline will answer every necessary purpose. I will endeavour to point out at the same time the object and meaning of the different enquires which are made, as it is very important to have clear views on this matter.

1. Having noted down the patient's name, age, sex, race (if peculiar), whether married or single, and the date of admission into hospital or when first seen, enquiry should be made with regard to *residence*, *social position*, *occupation*, *habits* and *mode of living*, with special reference to *food* and *drink*, *clothing*, and *cleanliness*. Thus information is obtained as to the *general history*.

2. The *family history* should then be taken, in order to ascertain if any hereditary tendency to disease exists. It may be necessary not only to enquire about particular diseases, but also with reference to the habitual state of health, the ages at which the death of members of the family may have occurred, and other matters which an individual case might suggest. Of course it is of primary consequence to investigate with regard to parents, brothers and sisters, and children; but grand-parents and collateral relatives, such as uncles, aunts, and cousins, must not be neglected, should there be any reason to believe that there is some hereditary taint.

3. The *previous state of health* of the patient is next to be investigated, and the occurrence of particular diseases noted. Among those maladies which it is particularly necessary to keep in mind are the acute specific fevers, rheumatic fever, pulmonary affections, and syphilis in certain cases. It is always well to ascertain how the chief functions are habitually performed, especially those connected with the digestive organs, and, in females, the menstrual functions.

4. Coming then to the *present illness*, enquiry must be made as to whether it can be traced to any definite cause; and as to its *clinical history*, including its duration, so as to determine whether it is acute or chronic, in the former case it being requisite to ascertain as nearly as possible the exact date of its commencement; its mode of invasion; the chief symptoms complained of; and their progress up to the time at which the patient comes under observation.

It will be evident that the chief object of the investigation thus far is to find out what causes have been influential in bringing about the morbid condition present, whether revealed in the *general history*, *family history*, *previous health*, or in the history of the origin of the *present illness*. No case ought to be looked upon as properly investigated, until every effort has been made to trace the mischief to its source, and, in order to arrive at a satisfactory conclusion on this matter, it will be obvious that it is essential to have as correct and concise a knowledge as possible of the ordinary causes which are likely to give rise to disease of each organ or system, as well as of the relation between particular causes and particular diseases.

The degree of difficulty in making out the ætiology of a case varies very considerably; in some instances it is evident at once, and one or more causes may be definitely and positively fixed upon; in others very careful and prolonged enquiry has to be made, and then, perhaps, without any substantial result. And here it must be remarked that much caution is often needed in accepting the statements of patients, and this applies especially to the account they give of their habits, family history, and previous illnesses. Many mislead from ignorance, but it must also not be forgotten that patients who indulge in vicious habits, such as abuse of alcoholic stimulants, or who have suffered from venereal diseases, not unfrequently try to conceal these facts.

Not only is the enquiry up to this point useful in determining the ætiology of a case, but further, the information obtained is often of material aid in diagnosis.

5. The next and most important step is to take the *present state, i.e* to submit the patient to a personal examination, and note the existing clinical phenomena. Here again it is necessary to impress upon students the extreme desirability of adopting a systematic course in conducting this examination. This not only materially facilitates the process of arriving at a diagnosis, but, not uncommonly, it is absolutely essential in order to come to a correct conclusion as to the seat and nature of a disease. When learning how to "take cases," it is desirable to go through a tolerably complete investigation of every organ and system of importance in the body, first noting down any *general* symptoms which may be complained of or observed.

The methods by which the required information is obtained are by *intelligent and orderly questioning* of the patient, or of friends or others who are in a position to render such information, should the patient be mentally or physically unfit to be interrogated; and by *objective* or *physical examination.* The former reveals subjective, the latter objective symptoms or *physical signs.* The term *physical examination* is somewhat ambiguously employed; properly it is synonymous with *objective examination,* and should include all modes of investigation in which the external senses of the observer are brought into use; by some, however, it is confined to certain special methods, such as those adopted in the exploration of the chest or abdomen. In conducting these methods most important aid is derived from the employment of various instruments, such as the stethoscope, laryngoscope, ophthalmoscope, thermometer, and microscope; and from the use of chemical tests.

It will be at once evident that what is ascertained by objective examination is generally far more helpful to the practitioner, and can be much more implicitly relied upon, than what is gathered from the statements of patients or others, and therefore this method ought never to be neglected, if it can be brought to bear in any way upon the investigation of a case. With regard to the subjective sensations of patients, although, of course, they should always be taken into account and duly weighed, both for diagnosis and treatment, yet the description of them must be received with a certain degree of caution, otherwise very serious mistakes may be made. They are liable to be exaggerated or misrepresented, and it must not be forgotten also that symptoms may point to one part when some other is actually the seat of mischief. There is one rule which should be invariably followed by the practitioner, viz:—to test the statements of patients, whenever this is practicable, by *personal* observation, so as to verify them or otherwise, and to find out as much as possible for himself. This remark may be illustrated by such symptoms as spitting of blood, vomiting, local redness or swelling, about which patients frequently give very unreliable accounts. The special modes of *physical examination* demand most careful study, as in a considerable proportion of cases one or other of them constitutes the only means by which a correct diagnosis can possibly be attained. In order to carry them out satisfactorily, much *personal* practice is needed, during which the several external senses are trained and educated, and the use of the various instruments is learnt, while at the same time a knowledge is acquired of the nature and meaning of the *physical signs* which are observed or elicited. It must be remarked that in subjecting patients to physical examination, regard must always be paid to their condition, for they may be too exhausted or otherwise incapacitated for undergoing the process, and might therefore be seriously injured if proper care were not exercised.

6. Having thus concluded the clinical examination of the patient, and methodically recorded the facts elicited, the student should then *write a commentary* upon the case, summing up its leading ætiological and clinical features, and giving his views as to its diagnosis, pathology, prognosis, and appropriate treatment. In this way the mind is trained for going through that process of reasoning which is always supposed to be performed when an opinion is being formed on these matters, but which too often receives very inadequate attention, or is even ignored altogether.

7. If possible, it is very useful to watch the case in its further *course* up to its *termination*, noting the progress of the symptoms, as well as any new phenomena which may arise, including *complications* and *sequelæ*. Should the termination be fatal, the *post-mortem examination* ought to be conducted in the same systematic manner as that during life, a record being kept of the condition of the various organs and structures.

Of course it is not to be expected that those engaged in ordinary practice can submit every patient to the complete routine examination just described, nor, indeed, is this required in the majority of cases; much of the general and family history will be known in many instances, and an experienced observer can usually obtain a speedy clue as to the probable seat of disease, and can frame and direct his enquiries accordingly. At the same time every practitioner ought to be thoroughly competent to carry out a full and searching investigation, should this be needed, while it is very important to avoid falling into the habit of conducting the enquiry in a careless and superficial manner, and every case should receive as attentive a consideration as its nature seems to demand.

A few concluding hints as to the mode of examining patients when rapidity of diagnosis is desirable, may be of assistance to young practitioners as well as to advanced students, especially those who may have to undergo examinations in clinical medicine.

1. Whenever a patient is first seen, the observer should always be looking out for anything which may be evident on a superficial and cursory examination. Much information is often thus gained, and important clinical phenomena may be at once noticed, which give most useful indications as to the seat or nature of the existing disease. The chief matters to which attention is to be directed are as follows:—*a.* The *general aspect* and *condition.* This may reveal, for example, the "typhoid state"; corpulence or emaciation; malnutrition of the muscles; a peculiar temperament; agedness; or striking evidences of some constitutional disease, *e.g.*, cancer or scrofula. *b.* The *posture* or *gait,* which may indicate great debility or helplessness; prostration; difficulty in breathing; restlessness; or immobility on account of pain, paralysis, &c. *c.* The *countenance.* This deserves careful study, for it often affords most instructive information. Thus we may observe an *abnormal colour,* such as the pallor of anæmia, or of syncope or shock; the peculiar tint of chlorosis; the malar flush of "hectic fever"; the redness and turgidity of plethora; the dusky or lived hue of some cardiac and pulmonary diseases; the white and pasty appearance characteristic of certain forms of kidney disease; or the yellow colour of jaundice. There may also be noticed puffiness, especially about the eyelids; a bloated condition of the face; or enlargement of the small blood-vessels. The *expression* is also frequently very characteristic, indicating, for instance, serious illness, pain, anxiety or morbid indifference, but especially as pointing to certain forms of insanity and other nervous disorders, such as mania, melancholia, imbecility, epilepsy, hysteria, or delirium tremens. Again, the *features* may give evidence of paralysis, or of muscular twitchings or convulsions, as in chorea or epilepsy; squinting or alteration in the size of the pupils may also be observed. *d.* The *state of the skin and superficial structures generally.* Here may be noticed an abnormal colour; the presence of eruptions; undue dryness or moisture of the skin; excessive or deficient temperature; subcutaneous dropsy, either general or local. *e. Symptoms referable to special organs.* In many cases one or more characteristic symptoms, pointing to a certain organ or system, may be obvious at once. Thus there may be signs of dyspnœa; phenomena referable to the nervous system, such as delirium, unconsciousness, various forms of spasmodic movements or paralysis; or vomiting and other symptoms pointing to the stomach. It must not be forgotten that the senses of *smell* and *hearing* may afford valuable assistance in this general examination. For instance, the breath may have some characteristic odour, such as that of alcoholism, uræmia, or gangrene of the lungs; or the attention may be drawn to the larynx or trachea by the sound produced during the act of breathing.

2. Having completed this general survey, the next point is to ascertain how long the patient has been ill, so as to determine

whether the malady is acute or chronic. Then enquiry should be made as to the prominent symptoms of which the patient complains, or which have been noted by others, and in the majority of cases, the attention will thus be directed to some particular region or organ, which is the seat of mischief. Should this not be sufficiently clear, a few leading questions may be put, so as to try to find out whether the malady seems to be localized in any part or if it belongs to the class of general diseases, in the latter case the further investigation being guided by the information obtained.

3. Should the clinical phenomena which are noted seem to point to some local morbid condition, the attention should then be directed first to the organ or part apparently involved, careful and complete enquiry being made with reference to the symptoms and signs known to be associated with it, of course employing *physical examination* whenever this can render any service. Then it must be borne in mind that many of the organs and systems in the body have a material influence upon each other in disease as in health, and therefore it is requisite in the next place to find out the condition of those organs which are most nearly related to that which is found to be primarily affected. After this a few questions may be asked, so as to find out the state of the chief systems in the body, even though no symptoms are complained of having any reference to them. Especially is it useful to pay attention to the digestive, respiratory, and circulatory organs, and in females to find out whether menstruation is normal. It is a good rule always to look at the tongue; to feel the pulse; to submit the lungs, heart, and vessels at least to a cursory physical examination; and to *test the urine*, particularly if the case under investigation is involved in any obscurity.

The discovery of the seat and nature of the malady from which a patient is suffering, often affords valuable suggestions as to the points to be principally attended to in the history, in order to ascertain the ætiological facts bearing upon the case. In this way not only may the diagnosis be rendered more certain and clear, but most useful indications for treatment are frequently brought to light.

VI. Diagnosis.

It cannot be too often insisted upon, that to endeavour to arrive at a *satisfactory diagnosis* ought to be the first duty of a medical practitioner in every case which is brought under his observation and treatment. Now it is very necessary for those who are studying medicine to understand at the outset what a *satisfactory* diagnosis means. It implies a complete, exact, and comprehensive knowledge of the case under consideration, as regards the seat, extent, origin, and nature of *all* existing morbid conditions. Of course such a diagnosis is not always attainable, but it is what should be conscientiously aimed at, and, if the observer has acquired the knowledge indicated in the previous chapters, and conducts his investigation with sufficient care and thoroughness, a tolerably correct opinion can generally be formed. It is not an uncommon error to be content with merely ascertaining the chief symptoms present, perhaps giving a name to the group, such as dyspepsia; or to fix upon one prominent symptom, *e.g.*, ascites or jaundice, and call that *the disease,* while no attempt is made to interpret the meaning of the phenomena which are observed, or to find out the pathological conditions upon which they depend. Again, when one or other of the organs is found to be structurally diseased, it often happens that very inadequate attention is paid to the determination of the precise locality, extent, and nature of the existing lesions, while the possibility of other organs being implicated is very liable to be overlooked, and thus the diagnosis is by no means so thorough and exact as it ought to be.

In attempting to form a diagnosis, a process of mental reasoning should be gone through, which needs to be more or less elaborate in different cases, according to their degree of difficulty, the facts elicited being passed in review, and certain conclusions founded upon them. The questions to be decided may be thus stated:—

1. Whether there is anything wrong at all?—for it must be borne in mind that not a few complain when there is no actual disease, especially among those who belong to the class of malingerers. 2. Should there be indications that the patient is really ill, it is requisite to determine:—*a.* Whether the ailment is *acute* or *chronic*? *b.* Does it belong to the class of *general* diseases, and, if so, what is its nature? *c.* Is the mischief localized in one or more of the organs of the body, or in some particular tissue? *d.* Should this be the case, is there merely functional disorder, or can any positive organic and structural change be detected? The seat, extent, and nature of all morbid alterations should then be made out as accurately as possible. It must not be forgotten that *local* lesions are frequently found accompanying so-called *general* diseases, such as the various fevers, and a diagnosis would be anything but complete in such affections, unless every care had been taken to ascertain whether any local mischief existed.

The exact mode of arriving at a diagnosis differs in different cases, while the degree of difficulty experienced in coming to a correct conclusion is necessarily very variable. In some instances we can make a *direct* diagnosis speedily and confidently, some combination of clinical phenomena, or some one or more *pathognomonic* symptoms clearly revealing the nature of the malady. In others the diagnosis has to be more or less *differential*; diseases which resemble each other being called up in the mind, and discriminated from each other. This is a less simple and easy process, and a very careful consideration of all the elements which are available for assisting at forming a diagnosis is often required. These elements, when the patient is first seen, are:—1. The account which is given of the *general history, family history,* and *previous health.* 2. The history of the *present illness,* as to its duration, probable cause, mode of invasion, and progress. 3. The actual clinical phenomena observed, especially those of an *objective* character. Even after the fullest consideration of all these points, it is sometimes impossible to come to any, or to more than a very doubtful conclusion. Under these circumstances it is exceedingly important not to form a hasty opinion, but to learn to wait and see what assistance the course of events may render. This rule is especially to be attended to in cases of acute febrile diseases, otherwise very serious mistakes are liable to be made. The further elements in connection with the progress of a case which may aid diagnosis, are :—4. Its clinical course, duration, and termination. 5. The phenomena observed on repeated examination under various conditions. 6. The results of treatment. In some obscure cases a diagnosis can only be made by *exclusion*, *i.e.*, by proving the absence of all diseases which might give rise to the symptoms observed, except one, the presence of which is therefore rather a matter of probability, than actually indicated by any positive signs. Occasionally it is quite impossible to come to any conclusion as to the nature of the malady from which a patient may be suffering.

In order to render the process of arriving at a diagnosis more easy and rapid, as well as to ensure greater certainty in the opinion formed, the following points are worthy of the attention of students. They should make themselves familiar with the more characteristic clinical signs of, at least, the *ordinary* individual diseases, *i.e.*, those symptoms which are diagnostic or pathognomonic. Then it is very useful to be able, speedily and without difficulty, to call up in the memory the complaints which have to be discriminated from each other, in any case which comes under notice. Therefore it is necessary to bear in mind what affections resemble each other; to have the chief diseases of the several organs arranged under the two groups of acute and chronic; and to be quite familiar with the pathological causes to which any very prominent symptom may be due, such as dropsy or jaundice. Lastly, in making a diagnosis it must not be forgotten that irregularities and deviations from the usual clinical course of diseases are often met with in practice; that many affections present distinct and well-marked *varieties*; and that some serious complaints are liable to arise very insidiously, not being attended with any prominent clinical phenomena.

VII PROGNOSIS.

To "give a prognosis" is often a matter of considerable difficulty, and in many cases it involves an amount of knowledge and tact such as can only be acquired by prolonged experience. Here it is only practicable to give a few general hints bearing upon the subject. In the first place it is requisite to understand what questions have to be determined in forming a prognosis, and to try to realize distinctly which of these apply more particularly to any individual case, before offering an opinion concerning it. These questions have reference to the progress, ultimate issue, and duration of the case, and the following include the most important :—1. Whether the disease is more or less likely or certain to terminate in death or recovery; or to continue for an indefinite period as a permanent and incurable malady, but without causing any danger to life? 2. In case of death may this event be expected to take place suddenly or slowly, and in what way will it probably be brought about? 3. If the patient recovers, will the cure be complete, or is there a danger of some morbid condition being left behind, either a state of general ill-health or some local organic lesion remaining? 4. What will be the probable duration of the complaint? 5. What events are liable to happen in its course, such as changes in symptoms, development of new symptoms, critical phenomena, the occurrence of complications, &c.? 6. Does its presence render the patient more amenable to other affections; or, on the other hand, does it afford protection against certain maladies? 7. May not slight symptoms observed be but signs and warnings of some more serious mischief which is likely to happen? For example, numbness, tingling, slight local paralysis, and other apparently trivial nervous phenomena may be premonitory of some grave organic lesion in the brain.

Of course it will be impossible to give a reliable prognosis unless a due knowledge has been acquired of the various points bearing upon this matter, in connection with each several disease, such as whether it is dangerous to life; its rate of mortality; usual modes of termination; ordinary duration; unfavourable symptoms; complications and sequelæ; and how it is influenced by accidental circumstances, whether dependent upon the patient or due to external conditions. It is always important to be cautious in offering any opinion as to prognosis, to give the matter due consideration, and to avoid anything like rashness or thoughtlessness. If there are good reasons for coming to a certain and definite conclusion, this ought to be stated confidently, and not with apparent doubt and hesitation. On the other hand, when the prognosis is questionable, it is a great mistake to give a positive opinion, but the state of affairs should be made as clear and explicit as possible to those interested, and the probabilities as to the result of the case pointed out, as well as the dangers which are liable to arise. It is better in doubtful cases to err in the direction of giving too hopeful an opinion rather than the opposite, especially with regard to acute diseases, as this often encourages perseverance in treatment upon which the issue may materially depend. Particular care is necessary in speaking to patients themselves about prognosis, and it should be a rule to make it appear to them as favourable as possible, due regard being paid to any dangers against which they need to be warned. At the same time the friends should be fully informed as to the exact condition of things in every case in which the prognosis is at all grave. In a hopeless case, should the patient desire a positive opinion, it is the duty of the practitioner to give all the information required.

CHAPTER IV.

TREATMENT OR THERAPEUTICS.

THE ultimate and most important object of the study of Medicine, in a practical point of view, is to learn how to cure, relieve, or prevent the various maladies to which the human system is liable. It needs to be particularly enforced at the present day, that treatment may be made efficacious in accomplishing most beneficial results, if conducted properly and according to true principles. It must further be added, however, that in order to become competent to carry out a satisfactory treatment, much experience is required, as well as the constant exercise of intelligent and independent observation and thought. There is always a danger of falling into a mere routine treatment of particular diseases; or of relying too implicitly on the experience and teaching of others. These mistakes should be avoided, and each individual case ought to be considered on its own merits, for even the same disease may require very different management under different circumstances, and therefore the practitioner should be able to bring his own knowledge and common-sense to bear upon the matter, and to use his discretion in varying the measures employed. Before commencing treatment an endeavour should always be made to realize distinctly what it is intended to accomplish by its aid; and what indications are afforded as to the measures which require to be adopted.

It is requisite to make a few general remarks upon the *objects*, *indications*, and *methods* of treatment.

The *objects* which have to be kept in view in treatment may be stated as follows:—1. To *cure* the patient as speedily and completely as possible. This is termed *curative treatment*, but though it is a reality, it is applicable to only a limited number of diseases. 2. To *guide the progress* of a malady towards a favourable termination, when this is not directly curable but must run a certain course, the object being to avert death and prevent permanent injury to health. This is termed *expectant* treatment, which may be illustrated by the treatment of most fevers, and it is very important that it should be duly recognized, as a great deal of mischief is often done by meddlesome interference, it being far better to let many diseases take their natural course, merely watching their progress and only adopting active measures when circumstances seem to require them. 3. To *prolong life*, and render the condition of the patient as comfortable as possible, should a fatal termination be inevitable. 4. To *remove or relieve symptoms*. The result may be merely *palliative*, or sometimes in a sense *curative*. For instance, the removal of ascites and other forms of dropsy may practically cure a patient, in so far that he is able for many years to follow the ordinary avocations of life, although the organic disease upon which the dropsy depends is permanent. It is entirely wrong in principle merely to direct treatment to symptoms, or to attempt to relieve them at the expense of the general disease. At the same time they frequently need particular attention, and in some cases nothing further can be done than to endeavour to mitigate them. 5. To *prevent* diseases. *Preventive* or *prophylactic treatment* is of the deepest importance. It includes attention to the general health of an individual, so as to obviate any tendency to disease; the prevention of the extension of a disease in the same person or to other individuals, and the guarding against possible complications; the warding off of habitual attacks, such as those of acute dyspepsia, asthma, or epileptic fits; and the rooting out of various maladies, especially of constitutional disorders from the members of a family, and of contagious diseases from the midst of communities. In some instances all that can be done in the way of prevention is to warn patients against actions which may give rise to injurious consequences, and to ward off everything that might prove hurtful.

The *indications* for treatment are derived from—1. The nature and seat of the disease. 2. The causes which have led to it. 3. The personal conditions and surrounding circumstances of the patient. 4. The symptoms present, which may not only call for the adoption of certain measures, but may *contra-indicate* a line of treatment which would otherwise be followed. 5. The state of the system generally and of the chief organs of the body. The condition of the lungs, heart, and kidneys often influences treatment materially, which is one important reason for making it a rule to examine these organs.

It will be found that there are certain indications to be followed in the treatment of affections of each organ or system, common to them as a class, as, for example, those of the lungs, heart, or digestive organs. These should always be borne in mind, and in the subsequent chapters an endeavour will be made to generalize as much as possible the principles of treatment applicable to the diseases of the several organs.

The general *methods* of treatment may be summarized under the following headings:—

1. *Therapeutic*, which implies more particularly the *administration of medicines*, and there is no question but that by their proper employment much good may be done. There are a few drugs which have undoubtedly a *specific curative* action upon certain diseases, and it is to be hoped that, as the result of the investigations which are now being made with regard to the action of medicines, many more *specifics* may be discovered. For the large majority of complaints, however, no curative medicine is known, and it is necessary strongly to warn those entering upon practice against believing in the so-called "specifics" for those diseases, such as phthisis, for which, from their very nature, no "specific" can ever be discovered. By using remedies in different doses and in various combinations, according to scientific and rational principles, we can modify materially the course of many affections, as well as exercise an important influence upon symptoms. It must not be forgotten that there are other modes of administering medicines besides by the mouth, especially by subcutaneous or intra-venous injection; by

means of baths, inunction, or endermic applications: by enemata; and by inhalations.

2. *Diet and general hygiene.* It is very necessary to bring this fact into special prominence, as it is apt to be frequently forgotten, viz: that *treatment does not consist solely in the administration of medicines.* In not a few cases these are not required at all, or they hold a very secondary place in point of importance, while their beneficial action may be almost invariably assisted more or less by paying due regard to the measures to be now mentioned. Attention to *diet* is often of the greatest consequence, proper directions being given, not only to the nature of the food and drink, but also as to its quantity, the intervals at which it should be taken, and other matters which an individual case might suggest. The use of *alcoholic stimulants* always demands the utmost care and consideration. They ought never to be recommended in an off-hand manner, or unless it is felt that they are really required; while as definite instructions as possible should be given with regard to the kind and amount of stimulant which should be taken, and other particulars, especially when it is deemed advisable to order spirits. It will often be found necessary to limit the consumption of stimulants, as habitual indulgence to excess is a common cause of ill-health. It is also essential always to keep in mind various matters connected with *general hygiene,* as these frequently need to be looked into, and have an important influence in treatment, such as the place of residence of the patient, with its surrounding conditions; habits of life; occupation; clothing; the kind and amount of exercise; and change of air or climate. It should be remembered that it is the duty of the practitioner to be prepared, if required, and especially in cases of acute febrile diseases, to attend personally to questions pertaining to diet and hygiene, so as to ensure that his instructions are duly carried out. Thus it is often advisable to examine food, such as beef-tea, and to see that it is of the proper kind and properly made; also to look to the conditions of the sick-room, especially as to ventilation and cleanliness, temperature, the state of the bed, and the removal of excessive curtains or carpets. If a nurse is needed, the practitioner should ascertain that she is competent and reliable, as upon her skill and attention the ultimate issue of many cases turns.

3. *Local and external applications.* These are often most serviceable in treatment, such as hot fomentations or poultices, cold applications, baths, liniments, ointments, lotions, blisters, sinapisms, plasters, mechanical appliances, electricity and galvanism, and gargles. In this connection may also be mentioned the employment of friction, shampooing, kneading, passive movements, and similar measures, which are sometimes very useful.

4. *Operations* are not uncommonly required even in medical practice, *e.g.,* venesection or the local removal of blood, paracentesis, acupuncture, the use of the aspirateur, or tracheotomy. When any such operation is clearly indicated, there ought to be no unnecessary delay or hesitation in having recourse to it.

SECTION II.

In the present section it is proposed to consider certain morbid conditions which are included under GENERAL PATHOLOGY, of which it is most desirable to have a comprehensive knowledge before studying them in connection with special organs or tissues.

CHAPTER I.

HYPERÆMIA OR CONGESTION.

HYPERÆMIA or CONGESTION signifies the presence of an excessive amount of blood in a part. According to its cause and to the vessels in which the accumulation chiefly occurs, the hyperæmia is said to be:—1. ACTIVE or ARTERIAL; 2. MECHANICAL or VENOUS; 3. PASSIVE or CAPILLARY. Each of these forms requires separate consideration.

I. ACTIVE OR ARTERIAL—DETERMINATION OF BLOOD.—In this form the arteries are chiefly implicated, being dilated, while there is an increased afflux of blood through them, though usually too much blood passes out by the veins as well, and the circulation is accelerated.

ÆTIOLOGY.—1. Paralysis of the muscular coat of the arteries is the usual cause of active congestion, in consequence of which they yield to the normal pressure of the blood. It is well known that this coat is under the control of nerve fibres which pass from the spinal cord through the sympathetic, and these exercise an important influence on certain pathological processes, including active congestion. The paralysis may be produced:—*a.* By direct lesion of the spinal cord in experiments, or as the result of injury or disease. *b.* By injury to the sympathetic trunk, of which the congestion resulting from the pressure of an aneurism upon the sympathetic in the neck is an example. *c.* By reflex irritation through the sensory nerves, such as the congestion following the application of a mustard poultice, heat, or cold to the skin; or that resulting from the excessive use or increased activity of an organ, such as the eye or mammary gland. Under the same category may be mentioned the congestion which often attends severe neuralgia. Probably many cases of congestion of internal organs originate in this way, and it is frequently the first step towards inflammation. *d.* By causes acting through the brain, which may be illustrated by emotional blushing, and by the effects of some poisons.

2. The rapid withdrawal of external support from arteries may cause them to be dilated, and thus lead to active congestion. This is seen in the effects following the application of a cupping-glass to the surface, by which the pressure of the atmosphere is removed.

3. The internal pressure on the vessels may be increased, either from an augmented force on the part of the heart, which princi-

pally affects the structures supplied by the arteries given off from the arch of the aorta; or from some channels being obliterated, the blood having therefore to find its way along those which are pervious, consequently distending them unduly. The best illustration of the latter is the "collateral circulation" which is speedily set up when a main artery is tied, or when it is suddenly blocked up in any way. Internal congestions are also often due to this cause, as when they follow exposure to cold, which leads to contraction of the small vessels of the skin, and thus the blood is driven inwards. If the walls of the arteries are weakened from any cause, and are deficient in tone, they are more liable to yield and to become dilated, but this condition does not appear sufficient in itself to determine active congestion.

SYMPTOMS AND EFFECTS.—The objective signs of *active congestion* are more or less bright redness, with turgescence and increased temperature. Pulsation in the arteries is increased and may be visible, while secretions are often more profuse or altered in quality. Ultimately the vessels may be so distended as to transude serum, or even to rupture and give rise to hæmorrhage. The subjective sensations are usually those of heat, fulness, and throbbing; the functions of a congested organ are often materially and seriously interfered with, as for example those of the nerve-centres or lungs. If the congestion continues for a long period it may lead to permanent hypertrophy or induration of tissues; the arteries also may become persistently dilated and thickened.

II. MECHANICAL OR VENOUS.—Here there is no excess of blood entering a part, but a difficulty is experienced in its passage through the veins, which, therefore, as well as the capillaries, become unduly filled with dark blood moving slowly and languidly. This is a very important form of congestion, and often leads to troublesome symptoms calling for the attention of the physician.

ÆTIOLOGY.—1. Some *mechanical* interference with the circulation of the blood through the veins is the most important cause of this form of congestion. This may be seated in the heart, thus affecting the entire systemic or pulmonary circulation, or both, according to the precise locality of the impediment. Or it may only involve some special vein or system of veins, such as the portal or those of a limb, the obstruction being localized. The cause of the impediment may be either something within the vessels, such as a clot; constriction from morbid changes in their coats; or external pressure upon them by a tumour, ligature, contracting lymph or other conditions.

2. Parts which are dependent are very prone to become venously congested from the mere influence of *gravitation*, and this is especially apt to occur if the tissues are relaxed and yielding, or if the *vis a tergo* is deficient. Illustrations of this mode of origin are presented in the congestion of the veins of the legs which follows long-standing; and in the formation of hæmorrhoids as the result of sedentary occupations.

3. A diminution in the *vis a tergo* often either itself gives rise to mechanical hyperæmia, or assists other agencies in its production.

The heart may be weakened in its action, or the arteries may be impaired as to their elasticity and contractility, owing to degeneration, and thus the forces which carry on the circulation are inadequate to drive the blood through the veins. This is especially observed in old people.

SYMPTOMS AND EFFECTS.—The objective signs, supposing the congestion to be superficial, are redness of a dull, dusky, purplish, or livid hue, with frequently evident distension of the capillaries and veins, the latter being often knotted; increase in bulk of the part affected, and not uncommonly a lowering of temperature. After a time the watery part of the blood transudes, containing some of its solid constituents in solution, and thus *dropsy* is produced, which gives rise to still greater enlargement, with a feeling of softness, and pitting on pressure. In some cases a fibrinous material is exuded, imparting to the structures implicated a firm and brawny feel, as may be observed after obstruction of the veins of the leg in phlegmasia dolens. When the kidneys are the seat of venous congestion, albumen is often present in the urine; while in connection with mucous surfaces the same condition leads to a watery flux.

If the congestion is still more intense the colouring matter of the blood passes out ; or the corpuscles migrate through the walls of the vessels into the surrounding tissues; or finally the vessels themselves give way and hæmorrhage occurs, as is observed in some cases of varicose veins, and in the bleeding into the stomach or intestines which sometimes follows obstruction of the portal vein. This event is especially liable to happen if the vessels are weakened, and the bleeding may take place into the substance of organs as well as on free surfaces.

Should the congestion be very great, rapidly produced, or long continued, it will lead to serious interference with nutrition, which may end in ulceration or gangrene. Occasionally a *thrombus* or clot is formed in connection with a congested vein, *e.g.* in the portal vein in cases of cirrhosis of the liver. With regard to organs or tissues, mechanical congestion causes them in course of time to become enlarged or thickened, while a fibroid material is formed, giving rise to induration, stiffness, and loss of elastic and contractile properties. Changes in colour are also not uncommonly noticed, to grey, brown, or black, due to alterations in the blood-pigments. Ultimately organs may become much contracted and diminished in size, indurated, and seriously disorganized as regards their structure.

The subjective symptoms will necessarily vary according to the part affected. Generally there is a sense of weight or dull heavy uneasiness, while the functions of the organ or structure involved are impaired to a greater or less degree. External parts which are the seat of venous congestion often feel cold and numb.

III. PASSIVE OR CAPILLARY.—Many include *passive* under mechanical congestion, but there is a distinction between them, though they are often associated. In passive congestion the capillaries are mainly involved, the circulation being languid in these vessels owing to a disturbance of the vital and nutritive relations between the elementary tissues and the blood. The conditions of a part thus congested are very similar to those observed in mechanical congestion. Atrophy of, and degenerative changes in the tissues are liable to occur, while they become prone to low and asthenic forms of inflammation, tending to assume a chronic character.

Ætiology.—1. A weak state of the general system may induce passive congestion, owing to the feeble activity of the circulation, and to the deficient nutrition and want of tone in the tissues. It especially affects parts which are dependent, or which are distant from the heart, as evinced by coldness and blueness of the extremities, nose, and ears. The *hypostatic* congestions which are met with in various low fevers and debilitating diseases also come partly under this category.

2. Morbid conditions of the blood may cause passive hyperæmia. That which accompanies imperfect aêration of the blood is considered by some to be of this nature; and deficiency of fibrin also favours its occurrence.

3. If an organ or part is locally debilitated from any cause, and the functions of its tissues are impaired, it is prone to become the seat of passive congestion. As illustrations of this may be mentioned the congestion which is often observed in paralysed limbs; and that which follows excessive functional activity of an organ, whereby it has become exhausted. It may also succeed active congestion or inflammation, owing to the perverted relations thus set up between the blood and the tissues, as is frequently noticed after tonsillitis.

Anatomical Characters.—Redness, varying in its tint and form according to its nature, is the essential anatomical character of all forms of congestion. In *active* congestion the colour is bright red, and it usually assumes the form of a minute net-work, but may appear to be uniform, or in points, when certain special structures are involved. It must be borne in mind, however, that there may have been active hyperæmia during life, and yet no redness be apparent after death, owing to the arteries having contracted and expelled the blood into the veins. Points of redness are sometimes seen which are due to minute extravasations of blood. The colour of *mechanical* or *passive* congestion is generally more or less dark-red, but it may present a blue, purple, or livid tint, while the veins are often visibly distended and form a net-work.

Organs are often said to be congested in post-mortem descriptions, when this has not been the case in reality during life, simply because the blood has gravitated after death into dependent parts, and has thus given rise to this appearance. Tissues also are subject to post-mortem staining by the colouring matter of the blood, which may simulate congestion. The results of congestion already described are frequently evident after death, such as dropsy or hæmorrhage, and if it has been long continued, considerable changes in the physical characters and structure of organs may be observed.

Treatment.—All that can be done here is to point out the principles which are to be borne in mind in the prevention and treatment of congestion, the particular measures to be adopted necessarily varying much in different cases. The indications are:—

1. To remove the cause of the hyperæmia, if possible, especially should this be of a mechanical nature. 2. To attend to position, so as to obviate the effects of gravitation, and assist the passage of blood through, and its return from the congested part. 3. To modify the general circulation of the blood, by acting upon the heart and vessels, either reducing its force when this is in excess; or assisting it when it is languid and feeble. 4. To diminish the quantity of the blood, either by venesection, or by local methods, such as the application of leeches or cupping. 5. To draw blood away from the seat of congestion by means of sinapisms, heat, or other irritants applied to the skin, dry-cupping, Junod's boot, and similar agencies. 6. To employ local measures with the view of diminishing the quantity of blood in the affected region, such as cold or pressure; or intended to promote its circulation, *e.g.*, friction, shampooing, or galvanism. 7. To alter the quality of the blood, employing low diet, purgatives, diuretics, and such remedies if there is plethora; improving its quality by the administration of good food and iron, if the blood is impoverished. 8. To improve the condition of the general system, when this is below par, especially in cases of passive congestion. It may be remarked that it is particularly important to endeavour to prevent and relieve congestion in febrile diseases; not to allow mechanical congestion to continue for any length of time, if it can be avoided; and to warn old persons against performing acts which lead to sudden temporary congestion, as their vessels are so liable to give way.

CHAPTER II.

DROPSY. HYDROPS.

Dropsy is only a symptom or pathological condition, though often a very important one, associated with certain general or local diseases. It consists in an accumulation of serous fluid which has escaped from the blood-vessels, either in the subcutaneous or submucous cellular tissue, in serous cavities, or in the cellular tissue of certain organs; it may occupy all these parts at the same time. The following terms are used to express the site of the dropsy:— Dropsy of the subcutaneous cellular tissue, if at all extensive is named *anasarca*, if localized, *œdema; hydrothorax* signifies accumulation in the pleuræ; *hydropericardium* in the pericardium; *ascites* in the peritoneum; *hydrocephalus* in the ventricles of the brain or arachnoid cavity; *œdema* is the term applied to the dropsy of organs, *e.g.*, œdema of the lungs. When dropsy involves both the cellular tissue and serous cavities, it is said to be *general*.

It is necessary to mention certain morbid conditions which are known as *spurious dropsies*, but which really have no pathological relation to dropsy. They include ovarian dropsy, which is a cystic disease of the ovary; accumulations of fluid in the interior of hollow organs, as the result of obstruction at an orifice, or inflammation, such as dropsy of the uterus (hydrometria), or of the gall-bladder; certain serous effusions consequent upon inflammation, *e.g.*, hydrocele, and acute œdema of the glottis; dropsy of the kidney (hydronephrosis), which is either due to cystic disease, or, more frequently, to obstruction of the ureter and consequent accumulation of urine and products of inflammation within the pelvis of the kidney, which gradually destroy this organ.

ÆTIOLOGY.—A dropsical accumulation is the immediate result either of excessive flow of fluid out of the vessels; of deficient absorption; or of both combined; in short the balance between exhalation and absorption is in some way disturbed. This derangement may be due to the following pathological conditions:—

1. Over-distension of the vessels in the different forms of congestion, but especially that dependent upon mechanical interference with the return of blood through the veins, is one of the most common causes of dropsy, which is then due both to an excessive escape of fluid from the vessels, and to their diminished power of absorption. Obstruction to the circulation on the right side of the heart thus causes more or less general dropsy, beginning in the feet and ankles and extending upwards, which may also follow serious impediment in the lungs. Obstruction on the left side of the heart leads to œdema of the lungs, because the pulmonary vessels are then distended. Any local obstacle may originate limited dropsy. Thus interference with the portal circulation is followed by ascites; a clot in a vein of the arm or leg, or external pressure upon it, will give rise to œdema of the corresponding extremity. Hydrocephalus is chiefly the result of pressure upon the small veins returning the blood from the ventricles of the brain. Gravitation necessarily influences much the seat of the congestive form of dropsy, and may itself induce it under certain conditions. Active congestion does not give rise to any great amount of dropsy as a rule, but it often causes local œdema.

2. A feeble and relaxed state of the vessels and tissues, in consequence of which the former readily yield and allow transudation of fluid, often aids in the production of dropsy. The œdema of the feet and ankles which is met with in many cases of general debility is partly due to this cause, being assisted by the weakened cardiac action, which induces mechanical congestion.

3. An unhealthy condition of the blood may occasion dropsy, especially if this fluid is very watery, deficient in albumen, or impregnated with certain morbid materials, such as urea. Under these circumstances its liquid portion readily transudes through the walls of the vessels. This cause often aids materially in the production of all forms of dropsy, but it is most important in connection with the anæmic and renal varieties.

4. It has been asserted that dropsy depends chiefly on a withdrawal of nervous influence from the vessels, and experiments have been made to prove that so long as the nerves remain intact dropsy will not occur even though the veins are over-distended. That the

nervous system does exercise considerable control over the processes of exhalation and absorption is beyond doubt, and it must therefore influence the occurrence of dropsy, but there is not sufficient reason to believe that it occupies the important relation to this symptom attributed to it by some pathologists. Œdema is not uncommonly observed in paralysed limbs.

5. It is highly probable that a deficient power of absorption on the part of the lymphatic vessels assists in giving rise to dropsy in some instances. Possibly this may exercise an influence in many cases of cardiac dropsy, the chief lymph-ducts being unable to empty themselves into the distended veins.

Such being the immediate pathological conditions which explain the occurrence of dropsy, and which are often more or less combined, its more obvious causes may be summed up as follows:—

1. *Any cardiac disease that interferes with the circulation of the blood*, and leads to overloading of the veins and capillaries. The most important are affections of certain of the orifices and valves of the heart; dilatation of its cavities; and degeneration of its walls, with consequent weak action. The heart may also be displaced or pressed upon by morbid conditions external to it.

2. *Affections of the lungs impeding the circulation.* When acute bronchitis complicates extensive emphysema, considerable dropsy may follow. Pulmonary affections also not uncommonly aggravate cardiac dropsy.

3. *Diseases of the kidney attended with deficient elimination of water and urea, but allowing the escape of albumen in the urine.* As a consequence the blood is impoverished and impure, and the vessels are over-distended. Scarlatina demands special mention in this connection as a cause of dropsy, as this symptom then generally depends upon acute renal inflammation.

4. *Diseases of the liver or any other morbid condition causing obstruction to the portal circulation.* This is a local variety of dropsy, resulting from mechanical congestion.

5. *Exposure to cold and wet, or anything occasioning a chill.* This cause is generally supposed to act by driving the blood inwards, and inducing active congestion, the resulting dropsy being named *active* or *febrile.* It chiefly acts, however, by checking elimination by the skin, and at the same time giving rise to congestion of the kidneys, these organs being consequently unable to perform their functions properly; hence the vessels become overloaded, and the fluid portion of the blood transudes.

6. *Any local obstacle in connection with a particular vein.* From this cause, dropsy often results from the pressure of a pregnant uterus, ovarian and other tumours, or aneurisms; as well as from inflammation of veins, varicose veins, and thrombosis.

7. *Gravitation of the blood into dependent parts.* Long standing may of itself lead to dropsy, especially if the blood is watery and the tissues are wanting in tone.

8. *Causes which impoverish the blood.* Dropsy may be induced by a want of proper diet, especially if combined with other unfavourable hygienic conditions; hæmorrhage or excessive discharges,

either natural or morbid; and various acute or chronic diseases, such as fevers, especially malarial, phthisis, cancer, splenic disease, scurvy, purpura, and other lowering affections.

9. *Certain conditions leading to active congestion.* Dropsy occasionally follows the rapid disappearance of chronic skin diseases or the sudden suppression of habitual discharges, and is then believed to result from active congestion. This may also be due to the irritation of some morbid deposit, such as tubercle or cancer; and it accounts for the œdema often observed in the neighbourhood of inflamed parts.

ANATOMICAL CHARACTERS.—The seat and extent of dropsy vary considerably in different cases, as already pointed out; and the same remark applies to the quantity of fluid accumulated. Dropsical fluid presents the following characters:—It is almost always thin and watery; either quite colourless or light yellow as a rule, but sometimes tinged by the colouring matter of the blood or bile; clear and transparent, or rarely opalescent; usually varying in its specific gravity from 1008 to 1012 or 1014. Its reaction is generally alkaline, but occasionally neutral or slightly acid. Chemically it is allied to the serum of the blood, consisting of water holding in solution albumen, alkaline and earthy salts, especially chlorides, and extractive matters, but the proportion of these ingredients varies much in different parts and in different cases, especially the amount of albumen, and the composition is never identical with that of blood-serum, the proportion of solids being much less. Fat, especially cholesterine, fibrin, or pigments are sometimes present, and urea in one special form, viz., in renal dropsy.

SYMPTOMS AND COURSE.—As a rule dropsy comes on more or less gradually, but sometimes its course is extremely rapid, and it may extend over the whole body in a few hours. It usually appears first and is most abundant in dependent parts, especially such as are distant from the heart; in those which are exposed; or in regions where there is much loose cellular tissue. It is liable to vary with position, being necessarily influenced by gravitation.

The objective signs of anasarca or œdema are swelling of the affected part, and superficial pitting on pressure, the skin being generally pale, but sometimes congested. The degree of enlargement varies much; it may be so great as to cause the skin to assume a tense, shining aspect, or even to burst or slough. The vitality of dropsical tissues is impaired, and hence they are very liable to erysipelatous and other forms of low inflammation either spontaneously or from slight irritation. When fluid accumulates within serous cavities, it may or may not produce evident enlargement, but its presence can be made out in most cases by certain "physical signs" to be hereafter described. The subjective symptoms accompanying dropsy of external parts are more or less discomfort or uneasiness, and a feeling of tightness or stiffness, but no actual pain or tenderness is experienced. An accumulation of dropsical fluid interferes mechanically with organs, and thus may cause most serious disturbance of their functions. In certain parts it may lead to a rapidly fatal issue, as, for instance, in the case of œdema of the glottis.

The general symptoms will necessarily vary according to the cause of the dropsy. If it is at all considerable in amount, the normal secretions are as a rule deficient in quantity.

Diagnosis.—It is usually not difficult to determine whether dropsy is present, but the chief point in diagnosis is to make out its cause. In order to ascertain this of course it is necessary to enquire into the history; to observe what other symptoms are present, both local and general; and to examine carefully those organs, diseases of which are known to occasion dropsy. Much help may, however, be derived from a consideration of certain facts with regard to this particular symptom, viz.:—

1. *Its place of origin, seat, and extent.—Cardiac* or *pulmonary* dropsy begins in both feet and ankles and extends upwards, ultimately becoming more or less general. Ascites only follows after the circulation through the liver has been for some time obstructed. *Renal* dropsy frequently starts in the face and upper part of the body, especially about the eyelids where there is much loose cellular tissue, and in the hands because they are exposed. It may rapidly spread all over the body, and involve all the serous cavities, though not usually to a great extent. *Hepatic* dropsy is confined to the peritoneal cavity at first, because the portal system is alone interfered with. The abdomen may become considerably distended before any dropsy is observed elsewhere, but in most cases after a while anasarca of the legs sets in, in consequence of the pressure exercised by the fluid upon the vena cava inferior. Anasarca of the legs and ascites may appear simultaneously, should there be any pressure upon the *inferior cava* just before it passes through the diaphragm. *Anæmia* never causes much dropsy; it is always limited to the subcutaneous tissues; and is usually only seen about the feet and ankles, or in the loose tissue of the eyelids. *Local* dropsy, as, for instance, œdema of one leg or arm, always indicates some local obstructive cause. Rarely the *superior cava* is pressed upon, and dropsy of the upper part of the body is the consequence.

2. *Its rate and mode of progress. Cardiac* dropsy is generally slow and gradual in its progress, liable for a time to some variation according to position, but ultimately this does not influence it much. It may increase rather quickly in consequence of some acute pulmonary complication. *Renal* dropsy, if acute, may be extremely rapid in its course, in some cases producing enormous enlargement of the whole body and obliterating the features in a few hours. This is the only form of dropsy in which such a mode of progress is observed; it may also disappear in the same rapid manner. *Hepatic* dropsy usually progresses slowly and steadily. That of *anæmia* comes and goes easily, being often present about the feet in the evenings, but disappearing with a night's rest, while the eyelids are puffy in the mornings.

3. *The effect of pressure* is said to distinguish between *cardiac* and *renal* dropsy, but this is a very unreliable sign. The latter is stated

to pit much less, and to retain the impression of the finger longer, elasticity not being quite lost.

4. The *appearance* of a dropsical part may assist the diagnosis. Thus in some cases of *renal* disease the skin presents a very peculiar dull-white, pasty aspect. In *cardiac* dropsy signs of venous congestion are often present, the skin being shining and tense.

5. *Characters of the fluid.*—That of *renal* dropsy is of a very low specific gravity, containing only a small quantity of albumen, and *urea* can in some instances be detected in it.

6. *The effects of treatment.*—The dropsy of *anæmia* is easily got rid of; the *renal* form can frequently be removed for a time or permanently by appropriate treatment; it is difficult to bring about absorption of *cardiac* dropsy as a rule, if it is at all considerable in amount, and it is liable to return speedily.

Prognosis.—The chief questions with which the prognosis of dropsy is concerned are its immediate danger to life; the probability of curing it permanently; and its temporary removal or alleviation. Caution should be exercised in giving an opinion, especially an unfavourable one, for cases which seem quite hopeless sometimes improve in a remarkable manner. The main data upon which the prognosis is founded, are:—1. The cause of the dropsy, and the possibility of removing this, special attention being directed to those organs which are so frequently accountable for this symptom. 2. Its seat, dropsy of some structures, *e.g.*, œdema of the larynx or lungs, being immediately dangerous to life; while in other parts it is very difficult to get rid of. 3. Its extent over the body, and the quantity of fluid accumulated. 4. Its duration and progress, acute and rapidly-spreading dropsy being highly dangerous, but at the same time often more easily dispelled than when it is chronic and steadily progressive. 5. The possibility of adopting appropriate treatment, and the effects resulting therefrom. This applies particularly to those active measures which have for their object the absorption of the fluid, much depending upon the strength of the patient and his ability to undergo the requisite treatment, as well as upon the state of those organs which are directly acted upon. 6. The condition of dropsical parts, there being more danger if their nutrition is obviously impaired, or if they are the seat of any form of low inflammation.

Treatment.—The objects to be kept in view in the treatment of dropsy are:—1. Its removal. 2. The prevention of its recurrence. 3. The prevention as far as possible of its injurious effects, if the fluid cannot be removed. The particulars of treatment must necessarily be governed by the cause of the dropsy and the condition of the organs, but there are certain general principles which need attention, of which an outline will now be given, as well as of the means by which they are to be carried out.

1. *Removal of the cause.*—As illustrations may be mentioned the relief of any pressure or constriction affecting a vein; or of an attack of acute bronchitis in cases of cardiac disease, which may seriously aggravate dropsy due to this cause. Of course it is highly important to attend specially to any organ, a morbid con-

dition of which is keeping up dropsy, and to try to cure this, or at all events to render the organ capable of performing its functions, so far as this is possible.

2. *Attention to rest, position, and regulated pressure.*—Far too little heed is usually paid to the influence of *rest* and *position* in the treatment of dropsy. The part affected should, if necessary, be maintained continuously and for a long time in an elevated position. Much benefit may often be obtained by keeping the legs, if the seat of anasarca, on a level higher than the body; or by raising an œdematous scrotum by means of a pillow of cotton-wool placed underneath. *Pressure* is also very valuable in many cases, if carefully and properly applied.

3. *Promotion of absorption of the fluid.*—This indication is carried out by employing *diaphoretics*, saline and watery *purgatives*, or *diuretics*, so as to promote free secretion by the skin, intestines, or kidneys, and thus remove some of the watery portion of the blood.

The only *diaphoretic* that is of much practical value is some form of bath which promotes perspiration, such as the warm, vapour, hot air, or Turkish bath. Either of these may be used as frequently as circumstances require; and local baths may be employed with much advantage if the patient cannot sustain general baths. It is in the treatment of renal dropsy that they are most valuable, and especially of acute cases. An occasional bath is also useful in preventing this form of dropsy. Diaphoretic medicines are often given, such as ipecacuanha, antimony, spirits of nitre, liquor ammoniæ acetatis, or citrate of potash, but they afford little or no assistance from their diaphoretic action in the removal of dropsy. Jaborandi might prove serviceable in some cases.

Watery purgatives are frequently most efficient in relieving dropsy, but care must be exercised in their administration, as they tend to weaken a patient. The most important are extract of elaterium (gr. ⅙ gradually increased to gr. ½); jalap (℈ i to ʒ i); and cream of tartar (ʒ i to ʒ ij); the last two form a very effective combination. They may be given two or three times a week or oftener if required. Other purgatives are employed, such as gamboge, veratrum, podophyllin, calomel, or croton oil, but these are much less admissible ordinarily, though they are occasionally serviceable. There can be no doubt that the effect of pills administered by certain quacks, which is sometimes really marvellous, is due to powerful drastic purgatives which they contain.

Diuretics are highly beneficial in some forms of dropsy. Those usually given are nitrate, acetate, or citrate of potash or soda in full doses, freely diluted; cream of tartar in small doses; spirits of nitre; infusion or tincture of digitalis, or the powered leaf made up into pills with other ingredients; squill in the form of tincture or pills; spirits or infusion of juniper; infusion of fresh broom tops; or oil of turpentine. The following pill will be found in some cases to have a good effect, given every other night:—℞. Ext. elaterii, gr. ⅙ to gr. ½; Pulv. scillæ, gr. ½ to gr. i; Pulv. digitalis, gr. ½ to gr. i; Ext. hyoscyami, gr. 1½. M. fiat pil.

Digitalis is also used as an external application, poultices of the leaves being placed over the abdomen, or the powder rubbed in, or fomentations of its infusion employed. Gin or whiskey freely diluted is undoubtedly efficacious as a diuretic in some cases.

Blood-letting is recommended in some instances, with the view of unloading the vessels and thus assisting the action of other remedies, but such treatment can rarely be indicated.

4. *Removal of the fluid by operation.*—If dropsy cannot be got rid of in any other way, it is necessary to have recourse to certain operations, and I believe that these are often delayed until too late a period, and ought in appropriate cases to be performed, not as last resources, but as curative measures. These operations include:—1. Paracentesis or tapping of serous cavities, especially to be adopted in certain cases of ascites. 2. Acupuncture or scarification of the skin in cases of anasarca. It is generally quite sufficient to make several superficial punctures with an angular needle in dependent parts, repeating them as often as required, and taking care that they are not inflamed by urine or other sources of irritation.

5. *Improvement of the condition of the general system and of the blood.* Treatment directed to this object is generally of much service, and it may be the chief thing called for, as in cases of dropsy due to anæmia. The digestive and nutritive functions must be attended to, as well as the diet, which should be of a nutritious character, without much liquid. All hygienic conditions must be properly regulated. Tonics are often indicated, and above all some preparation of iron, especially the tincture of the perchloride, which has a marked influence upon the composition of the blood.

6. *Prevention of irritation of dropsical parts.* It is important to keep all external dropsical parts clean and dry; to prevent them from being unduly pressed upon; and to ward off all other sources of irritation.

Chapter III.

HÆMORRHAGE.

Hæmorrhage signifies an escape of blood out of the current of the circulation, either from the heart itself, or from the arteries, capillaries, or veins. *Capillary hæmorrhages* are most frequent in medical practice. Generally the vessels are obviously ruptured, but it is supposed that bleeding may occur without actual destruction of their walls, as it may be impossible to discover any lesion even on the most careful examination, and it is known that the blood-corpuscles can penetrate the coats of the vessels.

The blood may be poured out on a free cutaneous, mucous, or serous surface; or into the interstices of tissues, the substance of organs, or morbid growths. An accumulation of blood in a solid organ or mass of tissue is named an *extravasation*, *apoplexy*, or, under certain circumstances, a *hæmorrhagic infarct*; cutaneous hæmorrhages assume the form of *ecchymoses* or more or less extensive patches, *stigmata* or minute points, *petechiæ* or rounded spots, and *vibices* or lines.

Special names are used to indicate whence the blood comes, of which the chief are *epistaxis*, or bleeding from the nose; *hæmoptysis*, from the air-passages or lungs; *hæmatemesis*, from the stomach; *melæna*, from the bowels; *hæmaturia*, from the urinary organs; *menorrhagia*, from the female genital organs.

Certain general terms are also often applied to hæmorrhages, with the view of classifying them, the meaning of which is sufficiently obvious. Thus they are said to be *traumatic* or *spontaneous*; *idiopathic* or *symptomatic*; *active* or *passive*; *arterial*, *venous*, or *capillary*; *vicarious*, *critical*, and *periodical*.

ÆTIOLOGY.—The causes of hæmorrhage may be thus arranged:—1. *Traumatic*. A vessel may be directly injured, as by a cut or contusion; by hard and rough substances, such as a calculus in the bladder, a foreign body or dry hard fæces in the alimentary canal; or by the extension of ulceration, gangrene, or cancer. 2. *Congestion leading to extreme distension of the vessels*. All forms of congestion may end in hæmorrhage, but especially if the force of the circulation is at the same time much increased, the pressure becoming so great as to cause the vessels to give way. Therefore whatever can occasion considerable congestion may bring on hæmorrhage, which is then usually of the capillary variety. As illustrations may be mentioned hæmorrhage into the stomach induced by cirrhosis of the liver: critical and vicarious hæmorrhages; those resulting from over-straining or local irritation; and that which follows embolism. 3. *Morbid conditions of the walls of the heart or coats of the vessels*. Among the most important are degeneration or aneurism of the cardiac walls; atheromatous or calcareous degeneration of the arteries; arterial aneurisms; varicose veins; degeneration or mere functional debility of the minute vessels. Where the vessels are not well-supported, as in the brain, or if the tissues are functionally weak, hæmorrhage from this cause is much more likely to take place. The feeble new vessels in recent inflammatory exudations, and those in certain vascular cysts or villous growths, are very liable to give way. 4. *Abnormal states of the blood*. These often predispose to hæmorrhage, *e.g.* in anæmia, especially if this is due to previous loss of blood; scurvy and purpura; low fevers, particularly typhus and small-pox; and in the condition induced by bad diet, chronic diseases, and other lowering agencies. The most important morbid condition of the blood, however, which gives rise to hæmorrhage, is that which is met with in the so-called *hæmorragic diathesis* or *hæmophilia*, where excessive bleeding occurs spontaneously or from very slight causes; in this affection there is a marked deficiency of fibrin, with an excess of red corpuscles. A plethoric state of the vascular system is favourable to some forms of hæmorrhage, and hence this may be predisposed to by overfeeding, sedentary habits, and other causes of plethora.

Hæmorrhage may occur at any time of life, but it is most common about the period when growth and development are proceeding rapidly; and in advanced life, when the tissues have undergone degeneration. It is also prone to affect different parts at different ages; thus in the young epistaxis is frequent; in young adults hæmoptysis; later on, hæmatemesis, melæna, and hæmaturia are more common; and in old age cerebral apoplexy. Some individuals are much more liable to hemorrhage than others.

ANATOMICAL CHARACTERS.—When hæmorrhage has taken place from the capillaries of a mucous membrane, it is often impossible even on the most careful examination to detect the vessels from which the blood has escaped. It has been assumed that under these circumstances no actual rupture has taken place. Generally the source of the bleeding can be discovered, and remnants of the blood are visible. Extravasations vary in amount from minute points of blood to large clots, which are either distinct and well-defined or mixed up with the tissues of the structure involved; there may be one or more. The blood is generally found coagulated more or less firmly, and at first presents a dark colour. It may cause irritation of the surrounding tissues, as evidenced by redness, inflammatory exudation, softening, or even the formation of an abscess. Its colouring matter may also stain neighbouring structures. If the extravasation does not soon prove fatal, it undergoes the following changes:—1. The colour gradually becomes paler, at the same time changing to brown or yellow, and ultimately it may become almost white; a granular pigment often forms simultaneously, with crystals of hæmatoidine. 2. The clot contracts in size, becoming firmer and being surrounded with a strong fibrous capsule; it also frequently itself undergoes organization into fibrous tissue and becomes vascularized, in which condition it may remain permanently. 3. In some cases it is absorbed, leaving a cystic cavity containing fluid, which may ultimately be taken up, the walls of the cyst coming together and only a hard cicatrix remaining, sometimes coloured by pigment. Occasionally nothing is left but altered blood-pigment of a yellow or black colour, especially on membranous surfaces; or there may be no trace of a previous hæmorrhage except a puckering and contraction. In some instances a clot softens and assumes a puriform appearance.

SYMPTOMS.—Active hæmorrhage is often preceded by premonitory symptoms. Thus there may be general excitement of the circulation, with a quick, sharp, and full pulse; or local sensations of weight or fulness and heat are complained of, with increased pulsation, the extremities being at the same time cold. Special symptoms frequently indicate the approach of bleeding in connection with particular organs.

The actual symptoms may be described as *general* and *local*.

General.—According to the quantity of blood lost, and the rapidity with which it escapes, hæmorrhage may either be unattended with any general symptoms; or prove more or less speedily fatal; or give rise to faintness or syncope; or merely originate an anæmic condition.

Local.—The local phenomena necessarily vary with the seat and amount of the hæmorrhage. Instant death may result from the mere local effects of the blood effused. The symptoms usually observed are dependent upon:—*a.* Mechanical interference with the functions of an organ, owing to the mere presence of the blood, as when it escapes into the pericardium and presses upon the heart; or when a large quantity accumulates in the bronchial tubes. *b.* Destruction of tissues, which may be broken up or lacerated. This generally happens when extravasation takes place into the substance of an organ, the functions of which are thus materially disturbed. *c* Irritation by the coagulated blood, this being liable to give rise to more or less local inflammation, with its accompanying symptoms. *d.* Excitation of certain acts which have for their object the discharge of the blood, should it escape on a free mucous surface. Thus blood in the stomach often causes vomiting; in the air-passages it excites cough. The amount and characters of the rejected blood vary considerably, and valuable indications are usually thus afforded as to the source of a hæmorrhage. It is often more or less mixed with secretions and other materials. The presence of blood may be indicated by *physical signs*, as, for instance, when it accumulates in the bronchial tubes or a pleural cavity.

DIAGNOSIS.—There are three main classes of cases which are met with in medical practice, bearing upon the diagnosis of hæmorrhage. At present it will only be practicable to offer a few general remarks with reference to these, more complete details on the subject being given under individual hæmorrhages.

1. Blood may escape or be discharged externally, as through the mouth or anus. The points to be then determined are:—*a.* The actual occurrence of hæmorrhage and the amount of blood lost. *b.* The source of the bleeding, both as regards the organ or part from which the blood comes; and the vessels from which it escapes. *c.* The immediate cause of the hæmorrhage, and the pathological condition or lesion upon which it depends. At the outset it is necessary to warn strongly against relying too implicitly on the mere statements of patients with regard to hæmorrhage, it being the duty of the practitioner to see the blood for himself, if possible, and to submit it to an adequate examination, thus ascertaining definitely and certainly not only whether bleeding has really taken place, but also the quantity and characters of the blood discharged. It must be borne in mind that malingerers sometimes pretend to be the subjects of hæmorrhage, while other patients mislead unintentionally; that other materials may resemble and be mistaken for blood; and that this is sometimes so altered in its characters, or mingled with other substances, especially when it comes from the alimentary canal, that it cannot be recognized as blood. The observation of the quantity and characters of discharged blood is often of material assistance in the diagnosis of the source and direct cause of hæmorrhage, which is further aided by a consideration of the history of the case; the mode in which the blood is expelled: the accompanying symptoms, general and local; the results of objective, and particularly of special modes of physical examination; and the further progress of the case.

2. The diagnosis of extravasation of blood into the substance of

organs or tissues has next to be considered. When these are subcutaneous, they are generally easily recognized, but those which take place in connection with organs, as the brain or lungs, or into the substance of deep tissues, often present more or less difficulty in their diagnosis. Extravasation associated with an organ is usually indicated by obvious local symptoms, which are frequently sudden in their onset. In this class of cases the diagnosis comprehends:—*a.* The fact of hæmorrhage having occurred, and its distinction from other lesions. *b.* The exact seat of the extravasation, so far as this can be determined. *c.* The amount of blood effused. *d.* The direct effects produced upon the implicated organ, and the further morbid changes subsequently set up by the extravasation. These questions can only be decided by a careful consideration of each individual case in all its details.

3. Hæmorrhages sometimes take place into cavities within thebody, as into serous or mucous cavities, and these may be on a large scale. Not uncommonly such cases are very obscure and it is impossible to make a positive diagnosis, but this might be arrived at from a previous knowledge of the presence of some morbid condition likely to be attended with such an event, *e.g.*, an aneurism; the occurrence of general symptoms of shock and loss of blood; and the discovery of local signs of the hæmorrhage.

PROGNOSIS.—In the large majority of instances hæmorrhage must be regarded as more or less serious, but its gravity differs very widely in different cases, and occasionally it is a favourable event within certain limits. The chief circumstances which influence the prognosis when blood escapes externally are:—*a.* Its amount. *b.* Its source and the immediate cause of the bleeding. *c.* The power of checking the hæmorrhage, and its liability to recur. *d.* The previous condition of the system, and the effects of the loss of blood upon it. Extravasations into organs are always grave, but their degree of danger depends on:—*a.* Their size and number. *b.* The organ involved, and the precise seat of the lesion. *c.* The cause of the hæmorrhage. *d.* The immediate and remote effects upon the organ implicated. Hæmorrhage into internal cavities is generally highly dangerous, on account of its ordinary causes; serious interference with the function of important organs; and the loss of blood, which cannot be prevented by any direct means.

TREATMENT.—The general principles and indications which are applicable to the treatment of hæmorrhages, and the means by which they are to be carried out, are as follows:—

1. The first indication is to *stop the bleeding,* should this be desirable; and to *prevent its recurrence.* It is not always advisable to check hæmorrhage, provided it is not serious in amount, for it may be the means of warding off some worse evil, as in many cases of bleeding from piles, or of epistaxis. Usually it needs to be stopped, and the following are the measures to be borne in mind for this purpose:—

a. Absolute *rest of the body* in the horizontal posture is frequently demanded; and, so far as this is practicable, the part from which the blood comes should be kept quiet, every disturbing action being avoided, such as cough in cases of hæmoptysis, or vomiting in those of hæmatemesis. Any effort that is liable to excite the heart or cause pressure upon the interior of the vessels should be guarded against and avoided.

b. Attention to *position* may prove most serviceable, the object being to assist the return of blood by the veins. Everything that can impede the venous circulation must be avoided.

c. The *circulation* must be maintained in as calm a state as possible, and should it be excited, while the heart is acting unduly, vascular sedatives are of the utmost value. Venesection is sometimes resorted to with the view of lowering the cardiac action, but this measure is very rarely indicated.

d. The administration of *astringents* in full doses is generally called for in medical practice, the most important being acetate of lead, gallic and tannic acids, sulphuric acid, alum, oil of turpentine, ergot of rye, matico, and tincture of steel. Some of these may be advantageously combined, and either tincture of opium or digitalis frequently forms a most useful addition. Subcutaneous injection of ergotine has been employed with much success. All food and drink should be taken cold, and stimulants must not be given unless absolutely required. In some forms of hæmorrhage the constant sucking of ice is exceedingly serviceable.

e. Local remedies are commonly indicated, such as pressure; astringent applications; cold, especially in the form of ice, which may be usefully applied to neighbouring parts, *e.g.*, to the chest or epigastrium in hæmoptysis and hæmatemesis, or even to distant parts, as in the treatment of epistaxis, which may sometimes be checked by the application of cold to the back of the neck. In cases of hæmorrhage from certain mucous surfaces, it is sometimes desirable to employ astringent injections, in order to bring the remedy into direct contact with the source of the bleeding. It may be necessary to have recourse to surgical measures, such as the use of the actual cautery, or torsion or ligature of vessels.

f. It is highly important to *improve the general condition* of the patient and the *state of the blood,* should these be at fault and give rise to a tendency to bleeding, by the exhibition of good diet, tonics, tincture of steel, and similar remedies. In this way hæmorrhage may often be prevented when it tends to recur. On the other hand, when it is associated with a full plethoric habit, the administration of saline aperients from time to time is very serviceable, while the diet must be restricted.

g. Sometimes it is advisable to *draw off blood* to parts distant from the seat of hæmorrhage, by means of heat or sinapisms to the extremities, Junod's boot, leeches, or dry or wet cupping; or to *prevent it from entering a part,* by the aid of pressure upon the main arteries.

2. The second indication is to attend to the *general effects* of the loss of blood. Syncope must be treated by position, stimulants, and other appropriate measures, as will be more fully described hereafter. In some cases transfusion of blood is demanded, in order to save life and to replace the blood which has been lost. Anæmia

calls for the administration of some form of iron, with proper dietetic and hygienic management.

3. The *local effects* of effused blood must also receive attention. In rare cases it may be desirable to have recourse to some surgical operation in order to remove an accumulation. Usually all that can be done is to keep the part affected entirely at rest, and to employ measures which tend to promote the absorption or removal of extravasated blood. The administration of iodide of potassium and the application of blisters are often decidedly useful measures for the purpose of aiding its absorption. If inflammation is set up, this must be treated by appropriate remedies.

CHAPTER IV.

INFLAMMATION.

WITHOUT attempting any comprehensive definition of this most important and complex pathological process, I proceed at once briefly to consider the principal points bearing upon it, and to endeavour to give such information regarding the present state of knowledge on the subject as the limits of this work permit.

ÆTIOLOGY. The causes of inflammation are numerous and varied, according as the morbid process affects different structures, but the following summary will serve to indicate their general nature.

Predisposing causes.—These influence not only the occurrence of inflammation, but also the part it affects and the variety it assumes. They may be classed as *general* and *local.*

1. *General.*—The condition of the entire system, but especially that of the blood, may materially assist in predisposing to inflammation. The most important general predisposing causes are debility with impoverishment of the blood, in whatever way originated; plethora, especially from over-feeding, combined with excessive indulgence in stimulants and general luxurious habits; and, above all, the presence of some morbid material or poison in the blood, as in the case of the eruptive fevers, gout, rheumatism, syphilis, or diabetes; or when the products of tissue-change accumulate in the blood, either from too rapid disintegration, as in fevers, or from deficient action on the part of the excretory organs, especially the kidneys and skin. Children and old people are on the whole most liable to inflammation, but this statement does not apply to all structures. Persons of sanguine temperament are also believedto be more predisposed than others.

2. *Local.*—The chief local predisposing causes of inflammation are mechanical or passive congestion; defective nutrition of the tissues, their power of resistance being impaired, as after a previous attack of inflammation, or when the vessels are in a state of degeneration; and impaired innervation. The last cause acts partly by direct interference with the nutritive process, and by

lowering the vitality of the tissues; but chiefly by diminishing the power of sensation and motion, so that the patient is not aware of the presence of irritants, and is at the same time unable to remove them.

Exciting causes.—1. *Mechanical injury or irritation* of some kind is a common cause of inflammation. Thus it may result from wounds or bruises, foreign bodies, calculi, extravasated blood, floating particles in the air, retained excretions, worms and other parasites, tumours, diseased bone or cartilage, gouty concretions, and various deposits. Under this head may be mentioned the inflammation which may arise from strain.

2. *Chemical irritants* are also powerful agents in exciting inflammation. A specific kind of inflammation may be set up in this way, as, for example, when croton oil, tartar emetic, or a blister is applied to the surface of the skin; or when arsenic or cantharides is introduced into the system, the former always affecting the stomach, the latter the kidneys. The inflammation resulting from the contact of air with certain surfaces, or of pus or gangrenous fluids, comes under this category, as well as that due to many kinds of improper food, and to the irritation of some animals and stinging plants.

3. The direct action of undue *heat* or *cold* upon animal tissues is a prominent cause of inflammation, its degree depending upon the intensity of the irritant and other circumstances.

4. Certain *specific organic poisons*, either by their local action or from their presence in the blood, are most important causes of inflammation, each giving rise to its own specific lesions, and affecting particular structures. They may enter the body from without, as in the case of the various contagious diseases; or be generated within the system, of which the morbific agents originating acute rheumatism and gout afford illustrations. It will be convenient to allude here to a view which is held with regard to the causation of pyæmic inflammation, viz., that it is set up by living organisms conveyed by the blood, and developed in inflammatory liquids undergoing putrefactive changes. The experiments of Dr. Burdon Sanderson constitute important evidence in favour of this view, and seem to point to certain forms of *bacteria* as the cause of pyæmic inflammation.

5. Internal inflammations are often caused by conditions which give rise to a *chill*, such as exposure to cold and wet, or to a draught when the body is heated and perspiring. These act principally by contracting the small cutaneous vessels and driving the blood inwards; but partly by interfering with cutaneous excretion, in consequence of which noxious materials accumulate in the blood.

6. *Deleterious products* may collect in the system from other causes, and induce inflammation. Thus the materials formed as the result of excessive destruction of tissues may lead to this result; and the inflammation which sometimes follows the sudden disappearance of a chronic skin disease, or the suppression of habitual discharges, is probably induced in this way.

7. *Undue activity* of an organ, either physical or physiological,

may give rise to inflammation of its structure. This may also follow previous organic disease.

8. Inflammation may originate in *irritation of a nerve*, and it may then appear at a distance from the seat of irritation.

9. When an organ or structure is inflamed, it may induce *secondary* inflammation in other parts, either by direct extension; by metastasis; or by the convection of emboli or septic matters.

ANATOMICAL CHARACTERS.—In considering this part of the subject, it will be expedient to describe at the outset the minute changes which are characteristic of inflammation, and to point out in what these essentially consist.

HISTOLOGICAL CHANGES.—These may be studied by irritating the transparent vascular tissues of animals, and watching the results with the aid of a microscope. The web of a frog's foot, its mesentery or tongue, and the bat's wing are most commonly employed for this purpose, and the following phenomena are observed:—

A. *Changes in connection with the Blood-vessels, Circulation, and Blood.* The phenomena associated with the vascular system constitute a most important element of the inflammatory process, and they occasion some of the more obvious anatomical signs of the change, such as redness and increased heat.

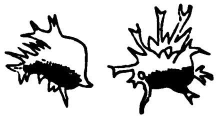
1. *Blood-vessels.*—In almost all cases the irritation causes an immediate *dilatation* of the small arteries, while they become elongated and tortuous; the dilatation increases for some 10 or 12 hours, and then remains stationary. Rarely there is a primary contraction of short duration. The veins enlarge after a while, and they assume a varicose or aneurismal aspect, presenting little irregular bulgings and contractions. The capillary walls undergo structural changes in course of time, fat granules accumulating in their substance, especially around the nuclei, and they send out processes by budding, which finally join together.

2. *Circulation.*—There is at first *increased rapidity* in the flow of blood, except when contraction of the arteries takes place. This is soon followed, however, by a rather sudden return to the normal rate of movement, and afterwards the circulation becomes slower, this change commencing in the veins. A to-and-fro oscillation is then often seen, and finally complete *stasis* or stagnation occurs, the vessels appearing to be crowded with red corpuscles. Neighbouring vessels frequently present all these different conditions with regard to the motion of the blood, and around the centre of stasis the vessels are usually over-distended, the circulation being slow, while still beyond this circle the current of blood is more rapid.

3. *Blood.*—Important phenomena are observed in connection with the blood-corpuscles:—The *white corpuscles* accumulate in the vessels, especially in the veins, and adhere to the walls, forming a continuous motionless layer, the central current still persisting until stasis is completed. Some observers believe that there is an actual production of these corpuscles in the inflamed part, and that thus their number is increased. After a time they penetrate the walls of the capillaries, and may be observed in various stages of their transit, forming button-shaped elevations, then hemispherical

prominences, then pear-shaped bodies, and finally separating altogether. This process is due to the power which these corpuscles possess, by virtue of their amœboid nature, of spontaneous movement, as well as of altering in shape and digesting the protoplasm of the vascular walls, so that no actual openings are left in the vessels to indicate where they have escaped. The liberated white corpuscles are named *leucocytes*, and after they leave the vessels they send out processes, assume peculiar shapes, and *migrate* far and wide into the surrounding tissues, at the same time often undergoing a process of division and thus becoming increased in number. The *red corpuscles* exhibit the same tendency to aggregation and stasis, and they may adhere to each other so closely that their outlines are quite obscured. They also migrate through the walls of the vessels, especially the capillaries, but not nearly to the same extent as the white blood-cells. Dr. Lionel Beale affirms that in inflammation minute particles of *bioplasm* or germinal matter of the blood pass through small rents or fissures in the capillary walls, and afterwards grow and multiply by division. Some of these particles, he says, are detached from white corpuscles. He considers that most of the particles seen outside the vessels originate in this way, and not from the direct transit of white corpuscles.

FIG. 1.



Amœboid Leucocytes. (*v.* Recklinghausen).

Another phenomenon which almost invariably occurs is the exudation of the liquid portion of the blood out of the vessels into the surrounding tissues. Though usually called *liquor sanguinis*, the exuded liquid is rarely identical with this fluid in its composition. It may be mere serum, but as a rule contains fibrin as well as albumen, and also a considerable proportion of phosphates, chlorides, and carbonates. Its nature and quantity will vary much according to the seat and intensity of the inflammation, as will be more fully pointed out further on.

The alterations thus far described cannot of course be observed in structures which have no vessels, such as cartilage; but they may then be noticed in the vessels of neighbouring tissues, from which the nutriment for the non-vascular structures is derived.

B. *Changes in the affected tissues.* The nutritive process in the inflamed tissues themselves becomes speedily disturbed, and in some structures this is the only perceptible deviation from health, there being no appreciable amount of exudation. Such inflammations are named *parenchymatous*, and are observed in connection with cartilages and certain organs, such as the kidneys. The first tendency is to the active production of cells,—*cell-proliferation* or *germination* as it is termed; this results from the increase in size of those already existing and of their nuclei, and the division of the latter along with the protoplasm of the cell-contents, which frequently assume a granular appearance, new cells being thus produced by endogenous formation. They also undergo many changes in form and exhibit amœboid movements. This cell-proliferation is active in proportion to the intensity of the inflammation, but varies greatly in different tissues. In epithelial structures it is very rapid; less so in connective tissue, cartilage, bone, and the cells of organs; and it does not occur at all in the higher tissues, such as nerve-cells. The new cells are prone to decay, especially if they are very quickly produced and if the inflammation has been severe; but they may develope into a permanent tissue, which tends to be of lower organization than the original one. Where inter-cellular substance exists, this often softens and breaks down, and the entire structure may become at last completely destroyed, the histological elements being involved in the destruction. Dr. Beale describes the bioplasm of inflamed tissues as increasing greatly in amount.

Pathological Terminations and Products. 1. The changes already described having taken place to a greater or less extent, what is termed *resolution* may follow, viz., a subsidence of the vascular disturbances and the absorption of any exudation, the tissue affected being restored to its normal condition. Any leucocytes which are present in it either undergo fatty degeneration before absorption, or possibly may re-enter the blood-vessels or lymphatics. Resolution may take place very quickly, this being termed *delitescence;* or *metastasis* may happen, *i.e.*, the disappearance of inflammation from one part with its simultaneous appearance in some other structure.

2. *Exudation and Effusion.*—As already stated, inflammation is usually attended with an escape of fluid from the vessels, varying much in quantity and composition. The material exuded may be either *serum; fibrinous exudation* or *lymph; blood;* or *mucin.*

a. Serum.—The best examples of this effusion are seen in connection with inflammation of serous membranes, and in the submucous tissue of certain parts, *e.g.*, the larynx. The fluid is not uniform in its composition and characters, but contains a variable amount of albumen and frequently also a little fibrin, with a considerable quantity of phosphates and chlorides. It may remain for a long time unaltered; or is absorbed if the inflammation subsides; or becomes more or less purulent.

b. Fibrinous Exudation—Lymph—Coagulable Lymph—Inflammatory Exudation.—These terms are applied to an exudation which attends some forms of inflammation, the material exuded containing more or less fibrin, and being spontaneously coagulable. There is really, however, no distinct line of demarcation between this exudation and inflammatory serous effusion. It contains a number of leucocytes, as well as cells resulting from proliferation of those originally belonging to the involved tissue, and Dr. Beale describes particles of bioplasm as being present in it.

Two kinds of lymph are recognized, viz., the *plastic* or *fibrinous*, which contains abundant fibrin-forming ingredients, tends to coagulate, and promotes tissue-development; and the *aplastic, corpuscular*, or *croupous*, in which there are a large number of cells, exhibiting but little tendency to organization, but being on the other hand prone to degeneration and to the formation of pus or other low products. The state of the patient, the seat and intensity of the inflammation, and other conditions influence materially the nature of the exudation.

After inflammation has subsided the exudation frequently undergoes organization into a new tissue; some pathologists affirm that only the leucocytes and the cells produced by proliferation, or the particles of bioplasm (Beale), become developed, the liquid portion merely nourishing these; others maintain that the fibrin coagulates and fibrillates, and itself contributes to the formation of tissue. Probably most of the new material is usually derived from cell-development, the cells being partly leucocytes and partly due to proliferation. Some kind of connective or fibrous tissue is generally produced, but bone, elastic tissue, epithelium, or fat, may be ultimately formed. Certain of the higher tissues, such as muscle and nerve, are never developed under these circumstances. This organization is well seen in the changes which occur in the granulation-tissue by which wounds cicatrize, and in the adhesions and thickenings formed in connection with inflamed serous membranes. The consequences of these changes are often very serious, structures becoming thickened, hardened, contracted, or bound together, and transparent tissues being rendered opaque.

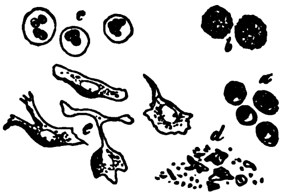
After organization a process of degeneration may set in, evidenced by wasting or withering, the substance becoming dry, yellow, horny, and stiff; by fatty or liquefactive change, which may lead to its absorption; or by the formation of black pigment. Similar changes may occur in the products of corpuscular lymph.

c. Blood is sometimes present in variable quantities in inflammatory exudations. It is partly the result of migration of the red corpuscles, but may have escaped owing to the actual rupture of vessels, especially of those recently formed.

d. Mucin.—In inflammation of mucous membranes this substance is sometimes met with, and gives a tenacious, stringy character to the fluid discharged from the surface.

3. *Suppuration or Formation of Pus.*—The tendency to suppuration varies according to the tissue affected and the constitutional condition of the patient, but it is generally more liable to take place if the inflammation is very severe and concentrated. Pus may form on a free surface and be discharged, being then often mixed with other materials; it may accumulate in serous or other cavities, or it may involve the substance of tissues and organs, either as a circumscribed abscess, or as diffuse purulent infiltration. In its physical characters healthy pus is a thick, viscid, pale-yellow liquid, odourless, alkaline in reaction, with a specific gravity of about 1030. It consists of a fluid—*liquor puris*—in which float pus-corpuscles and other microscopic particles. Liquor puris is an albuminous fluid, but also contains salts, pyin, chondrin, and fat. The corpuscles closely resemble white blood-corpuscles in size and appearance, being more or less round or sometimes irregular, granular, and having one or more nuclei, which are rendered more evident by acetic acid and often break up when acted upon by this reagent. They have the power of spontaneous movement and migration, and can alter in form, as well as increase in number by fission.

FIG. 2.



Pus-corpuscles. *a*. From a healthily-granulating wound; *b*. From an abscess in the areolar tissue; *c*. The same treated with dilute acetic acid; *d*. From a sinus in bone (necrosis); *e*. Migratory pus-corpuscles. (Rindfleisch.)

Dr. Beale describes pus-corpuscles in the *living* state as being masses of bioplasm without any cell-wall, which assume a variety of forms but are never spherical, send out protrusions in all directions, these becoming detached and forming new corpuscles, and which are capable of spontaneous movement. He further states that when *dead* they assume the spherical shape, their movements cease, a sort of cell-wall forms, they become more granular, and bacteria are developed in them. It is in this condition they are usually seen under the microscope. It is now generally considered that the great majority of pus-cells, especially in the earlier stages of inflammation, are merely leucocytes. Beale believes they are derived from the particles of bioplasm which escape. Others are subsequently formed by proliferation of the cells and germinal matter of the affected tissue, and they increase in number by cleavage and endogenous formation. Leucocytes possess the power of destroying the tissues with which they come into contact, and it is partly in this manner that an abscess makes its way to the surface.

Various kinds of pus are described, such as *healthy* or *laudable; ichorous* or *watery; serous; sanious* or *bloody*. It may decompose and form highly noxious gases, and sometimes undergoes physical and vital changes if not discharged, its fluid portion being absorbed, while its cells become withered and undergo fatty degeneration, so that it is converted into a cheesy mass, containing fat granules, shrivelled cells, and nuclei. Ultimately the remains may calcify.

4. *Softening* of tissues is not an uncommon result of inflammation, and it may terminate in the complete breaking-down and destruction of the structures affected. This may be illustrated by the softening which usually accompanies inflammation of the brain.

5. *Induration* is another consequence of inflammation, especially when chronic, being due to the substitution of an imperfect fibrous tissue for the normal structures.

6. *Interstitial absorption* is sometimes observed, as in the case of inflammation of bone.

7. *Ulceration.*—When inflammation destroys the tissues on a surface an *ulcer* is formed. If this is quite superficial, only epithelium being removed, it is termed an *excoriation* or *abrasion*. Ulcers of different kinds frequently come under the notice of the physician in connection with mucous surfaces. Usually there is a discharge

of pus after the inflammatory process subsides. An ulcer tends to cicatrize by the development of granulation-tissue into fibrous tissue, which afterwards is liable to contract, and may thus lead to serious consequences. Ultimately the original structures may be developed anew, but this is not accomplished for a long time, and some tissues are never reproduced.

8. *Gangrene or Mortification.*—If inflammation is very intense, rapid death of the involved tissue in mass may result under certain circumstances, and a slough is formed, which becomes isolated from the living textures and undergoes a process of separation, leaving an ulcerated surface. This event is the consequence of direct injury to the vitality of the inflamed structure; of the stagnation of blood; and of the injurious effects produced by the exudations. Almost any tissue may mortify from this cause, but gangrene is particularly observed in the subcutaneous areolar tissue, and in the mucous membrane of the alimentary canal, being but rarely seen in organs. It is of the moist kind, and therefore the slough is liable to undergo rapid decomposition.

GENERAL MORBID ANATOMY.—The exact appearances and other objective characters which accompany inflammation must of necessity vary widely according to the part involved; the intensity, rate of progress, and type of the inflammatory process; the nature and amount of its products, which differ materially in different tissues; and numerous other circumstances. Hence it is impracticable to give any very definite and precise general description of its more obvious anatomical characters. It may, however, be useful to present a brief summary of, and to contrast the more evident effects which inflammation is liable to produce, in connection with the principal classes of structures.

The Skin.—The morbid changes which accompany cutaneous inflammation are so obvious and well-known, that they have come to be regarded and familiarly described as the typical and characteristic signs of the inflammatory process. One of the most constant anatomical characters is redness, varying in its extent, degree, and hue, the latter usually tending towards brightness. If the inflammation is limited, the colour is more intense at the centre of the affected area, and fades off towards the circumference, while it diminishes or disappears under pressure. The small veins may be visibly enlarged. There is increased local heat, either evident to the touch or detected by the thermometer. Swelling or thickening of the cutaneous structures is often evident, and they feel soft or firm according to circumstances. The epithelium undergoes proliferation, while the superficial layers frequently soon lose their vitality and are shed freely. Serum may be effused upon the surface of the skin, giving rise to superficial moisture; under the epidermis, originating vesicles, or larger bullæ, or blisters; or into the tissues beneath, causing subcutaneous œdema. A fibrinous exudation containing leucocytes may also collect in the substance of, or beneath the skin, the tissues hence feeling thickened, firm, and brawny. The glands are liable to become enlarged, their cells increasing rapidly. Papules, wheals, or pustules form in certain varieties of inflammation; or it may lead to superficial cracks or abrasions, ulceration, diffuse suppuration, or gangrene.

The precise changes differ much in different cases. The inflammation may be quite superficial or extend deeply, and varies considerably in its extent and duration. The skin is the seat of peculiar kinds of inflammation in connection with some of the acute specific fevers. In chronic cases the cutaneous structures undergo serious and permanent organic changes.

Serous and allied membranes.—In serous inflammations there is at first marked redness, with loss of polish, more or less opacity, and thickening of the membrane. Then a fibrinous exudation is deposited on the surface, varying much in its amount, characters, and arrangement, which contains abundant cells, chiefly leucocytes, but partly derived from proliferation of epithelium cells. At the same time an effusion of fluid takes place into the serous cavity, which is more or less turbid, and contains coagula as well as numerous cells similar to those in the fibrinous layer. The further tendency is usually towards the absorption of this fluid, and the formation of thickenings, adhesions, or agglutinations in connection with the membrane. These are generally supposed to result from the organization of the layer of lymph with its inclosed cells, fibrous tissue being thus developed. It has been stated, however, that, at least in many cases, this fibrinous layer does not become organized, but undergoes fatty degeneration and subsequent absorption; and that the adhesions result from the development of small vascular papillæ or granulations which form on the surface of the membrane, under the epithelium. If the inflammation is intense or prolonged the fluid may become purulent, and the same event is apt to occur in certain constitutional conditions.

Though serous inflammations vary much in their extent and products, it may be stated that their general tendency is to originate materials which are prone to become organized.

Mucous membranes.—In connection with mucous membranes three varieties of inflammation are described, viz., *catarrhal*; *croupous*, *membranous*, *plastic*, or *fibrinous*; and *diphtheritic*.

Catarrhal.—This is the ordinary form of mucous inflammation. It commences with hyperæmia and swelling of the membrane, which is at first abnormally dry. Soon, however, there is an increased secretion of a watery or viscid mucus, the latter containing abundant cells derived from the proliferation of the epithelium and from leucocytes, and if the inflammation continues, the discharge assumes a more or less purulent appearance, owing to the large number of cells present, many of which have the precise characters of pus-cells. The mucous glands and follicles enlarge and become also filled with cells. In some cases the submucous tissue becomes infiltrated, and if it is of lax texture a considerable amount of serum may collect in it. Abrasions or ulcers of the membrane are not unfrequently originated. If the inflammation becomes chronic, considerable changes are produced in the structure of the membrane and its glands.

Croupous.—This variety differs from the former in that a layer of so-called *false membrane* is deposited on the surface, varying in thickness and consistence. It is formed of coagulated fibrin, either amorphous or fibrillated, enclosing epithelium and other cells; or it may be entirely made up of altered epithelium-cells without any fibrin. Even when distinctly fibrillated it shows no tendency towards permanent organization.

Diphtheritic.—Some pathologists regard diphtheritic as differing from croupous inflammation in that a fibrinous exudation forms, not only upon, but in the substance of and beneath the mucous membrane, which as a consequence is destroyed and converted into a slough, and an ulcerated surface is left on its separation. The reality of this distinction is very questionable.

It will thus be seen that inflammation of mucous membranes differs from that of serous membranes in that the products have no tendency to become organized, owing to the abundance of cellular elements which are discharged in the secretions.

Organs.—In addition to other causes which influence the inflammatory process, the pathological results of inflammation of an organ depend very materially upon the structures entering into its formation, and they further differ even in the same organ according to the particular tissue involved. In acute inflammation there is almost always a change in colour, which usually, though not invariably, tends towards redness at first, but subsequently may pass through various hues. The vessels are overloaded, and an unusual amount of blood escapes on section. Some organs become œdematous in the early stage of inflammation, so that a quantity of serous fluid can be expressed from their tissues. The principal more immediate effects are proliferation and destruction of epithelium-cells, where these exist, the products either accumulating or being carried away; changes in special structures, such as those of the liver or nerve-centres, usually of a destructive character; formation of fibrinous exudation containing leucocytes; and increase or softening and breaking down of interstitial tissue, when this is present. On account of these processes many very obvious alterations in physical characters are brought about. Organs are often enlarged and heavier than normal, or the specific gravity of the affected portion is increased. Occasionally inflammation leads to wasting and diminution in bulk, or this may remain unaltered. The consistence may be increased or diminished, some structures becoming apparently firmer and more solid, others undergoing rapid softening; it is often found, however, that even when organs seem to be unusually firm, their consistence is really lessened, their tissue readily tearing or breaking down under pressure. A section frequently reveals marked alterations in the general appearance and structure, and inflammatory products may be visible to the naked eye, or microscopic examination reveals their presence. The subsequent progress varies considerably. Resolution or absorption often takes place, the structures being restored to their normal condition; or the inflammation may terminate in speedy destruction of the tissues, the formation of an abscess, diffuse suppuration, or gangrene. Ultimately, if death does not happen, an inflamed part may remain permanently altered in its characters and structure more or less; or remnants of the pathological products may be evident, in the form of fibroid tissue, caseous or calcareous deposits, &c. Chronic inflammation of organs usually tends to cause contraction and hardening, with increase of cellular tissue.

Pathology.—It is requisite now to consider the nature and origin of inflammation, and to attempt to explain its characteristic phenomena. Formerly it was believed that the changes observed in inflammation could be accounted for on physical principles. Thus the disturbance of the circulation and ultimate stasis were attributed to dilatation of the vessels; to blocking up of the capillaries by the successive production of white corpuscles, and the adhesion of these, as well as of the red globules, to the walls of the vessels and to each other; to the formation of minute coagula; and to inspissation of the liquor sanguinis. Exudation was believed to be the necessary result of this stasis and of the dilatation of the vessels. It is now certain, however, that the phenomena of inflammation cannot be thus explained, but that they are due to some disturbance affecting the vital properties and mutual vital relations of the tissues, blood-vessels, and blood. This pathological process, affecting the nutritive conditions and being in fact merely an alteration in nutrition, results from some injury to, or irritation of a tissue, either directly inflicted, or set up indirectly in connection with some general condition. It is generally believed that an impression is thus produced on the centripetal or sensory nerves, which is communicated to the vaso-motor centre, thence reflected to the centrifugal or vaso-motor nerves and conveyed by them to the vessels, which consequently dilate, probably owing to a paralysis of their muscular coat. The primary acceleration of the flow of blood may be due to this dilatation, but the subsequent phenomena are probably the result of some alteration in the vital properties of the living tissues, including the coats of the vessels, the blood, and the surrounding structural elements. The vascular walls are so modified as to lead to stasis of the blood-current, the corpuscles readily adhering to them, while they allow of the free passage of the liquid portion of the blood and of leucocytes, having lost their resisting power. The blood-corpuscles also exhibit an increased tendency to aggregate together. With regard to the cell-proliferation and increase of bioplasm, this is believed to be due to the direct influence of the abundant supply and frequent change of the nutritive fluid which escapes from the vessels in stimulating growth and development; and to the increased heat accompanying the inflammatory process. It is not unreasonable to suppose, however, that the primary irritation may immediately set up this overgrowth, or that it may be originated through the nerves directly; while it may possibly itself tend to promote a free escape of fluid from the vessels, because it creates a greater demand for nutriment. Some pathologists are of opinion that the whole process of inflammation is due to a direct change in the vessels or blood, set up through the molecular tissues of the part affected, and that it is quite independent of any nervous influence. The more recent experiments of Cohnheim seem to support this view.

The origin and nature of the different inflammatory products, and the pathological results to which inflammation may lead, have already been sufficiently explained. The more obvious signs of inflammation are readily understood. For instance the redness is due chiefly to over-loading of the blood-vessels, and blood-stasis; partly to migration of red corpuscles, or rupture of small vessels and consequent extravasation. The changes in the blood-pigment, and the accumulation of inflammatory products, will explain subsequent alterations in colour. Swelling, increase in bulk, and changes in consistence and specific gravity, depend upon the increased quantity of blood in the affected part, the presence of exudation or effusion, and the proliferation of tissue. Acute softening and wasting of an organ is usually due to rapid degeneration and destruction of its tissues. Increased local heat is mainly the result of the increased activity of chemical and nutritive processes in an inflamed structure, but to some extent of the augmented flow of blood through it. Beale attributes this phenomenon to the rapid growth of bioplasm.

SYMPTOMS.—The precise clinical phenomena associated with inflammation necessarily present much diversity, but the following outline will indicate their general nature.

1. *Local.*—*a.* If an inflamed part is visible, it usually presents the characteristic objective phenomena already described under anatomical characters, especially *redness, swelling*, and *increased local heat.*

b. Inflammation is commonly attended with *local subjective symptoms.* Of these *pain* is one of the most frequent, its intensity and characters differing much according to the tissue affected; it may be entirely absent, however, even when structures are involved inflammation of which is usually attended with much pain. Anything that disturbs or irritates the affected part will generally aggravate the painful sensations; while there is almost always *tenderness* on pressure, which may exist even without any spontaneous pain. Other morbid sensations, not amounting to actual pain, are often complained of, such as uneasiness, itching, burning, fulness or tension. These symptoms are necessarily due to the nerves being affected in some way or other, either being involved in the inflammatory process or pressed upon by exudations. Sympathetic pains are sometimes referred to parts distant from the seat of inflammation; or pain may only be felt in some structure which is supplied by the same nerve as that which is affected.

c. The *functions* of inflamed organs and tissues are always disturbed more or less, on account of the vascular disorder; of actual changes in the involved textures; of the mechanical effects of the pathological products; and of the acts which these frequently excite with a view to their removal, such as cough in bronchitis. Secretions are modified as to quantity, general characters, and composition, when the organs forming them are inflamed.

d. The accumulation of effusion or exudation may lead to symptoms more or less serious, by interfering with neighbouring structures and organs. This is particularly the case in connection with inflammation of serous membranes.

e. When internal parts are the seat of inflammation, this condition can often be made out by *physical examination*, which reveals physical signs of a significant character.

2. *General* or *constitutional.*—At present it must suffice to state that the general symptoms of *acute* inflammation are those of *fever* or *pyrexia*, which will be hereafter described. The fever is usually of the so-called *inflammatory* type at the outset, but differs much in its intensity, especially according to the tissue affected. The occurrence of suppuration is often indicated by a severe fit of shivering, and the fever is then apt to assume the *adynamic* or *hectic* type. *Typhoid* or *adynamic* symptoms are also liable to be developed under other circumstances, but particularly if the inflammation assumes a low form, or if it terminates in gangrene.

As a rule the blood is hyperinotic, containing excess of fibrin and coagulating firmly, often presenting the "buffy" coat. Water is in excess, but albumen and salts are deficient. The red corpuscles show a marked tendency to run together, and under the microscope are seen to form "rouleaux."

The fever attending inflammation is *symptomatic* or *sympathetic*, and it is supposed to result either from paralysis of the vaso-motor nerves generally; or from increased temperature of the entire blood, consequent upon the local excessive production of heat.

VARIETIES. Inflammation presents many named varieties, which are founded on different characters. Thus it is said to be:—*a. Acute*, *sub-acute*, or *chronic*, according to its intensity and rate of progress. *b. Sthenic* or *asthenic*, according to the general symptoms present. *c. Plastic*, *adhesive*, *suppurative*, *ulcerative*, or *gangrenous*, according to its products and mode of termination. *d. Circumscribed* or *diffuse*. *e. Healthy* or *phlegmonous*, or *unhealthy*. *f. Primary* or *idiopathic*, or *secondary*. *g. Non-specific* or *specific*, the latter including rheumatic, gouty, syphilitic, gonorrhœal, strumous, tubercular, and other special forms.

TREATMENT. It is not easy to give even a general outline of the treatment of inflammation, as this has to be so much modified under different circumstances. At present only the chief principles of its management can be briefly pointed out.

A. Measures must be taken to *prevent* inflammation, should there be any condition present in which this process is likely to be set up. For instance, after an injury the part affected should be kept at rest and appropriate remedies applied. In conditions of the blood which tend to originate secondary inflammations, every care should be exercised in warding off such influences as are likely to favour this event. If there is paralysis of any part, all local sources of irritation must be avoided. These illustrations will suffice for this point.

B. Supposing inflammation to have been established, the main indications for treatment, and the means for carrying them out, are as follows:—

1. The first indication is to subdue the morbid process as soon as possible, and to prevent or limit the accumulation of various exudations and effusions. In order to carry out this principle, it is essential to *remove the cause* of the inflammation, if practicable; to keep the part affected in as *complete a state of rest as possible*, physiological as well as physical; to avoid every *source of irritation*; and in many instances to attend to *position*, so as to obviate accumulation of blood. By such measures further disturbance will be avoided, while the involved structures are left in a condition most favourable for recovery.

The active measures employed are those usually termed *antiphlogistic*, which have for their more immediate object the lowering of the increased vascular action in the inflamed tissue. It is necessary to allude briefly to the most important of these agencies.

a. Removal of blood. This was in times past the great remedy for inflammation, but at the present day the tendency is to go to the opposite extreme, and to ignore blood-letting altogether. Blood may either be removed by venesection—*general blood-letting*—by which the heart's action is at the same time moderated; or it may be taken immediately from the vessels in the neighbourhood of the affected structure, by means of leeches, cupping, punctures, scarification, or incisions—*local blood-letting*. With regard to the former method, without entering into any discussion on the subject, I venture to express the opinion that it is not often required, and great care should be exercised in determining that any individual case demands its adoption. As will hereafter be pointed out, inflammation of certain tissues and organs may necessitate venesection, but it should never be practised if the patient is debilitated, or if the inflammation is dependent upon some morbid poison in the blood. If performed at all, it should be had recourse to at an early period, before inflammatory products have accumulated to any extent. Local blood-letting is frequently most serviceable, and there can be no doubt that it is not made use of to the extent which it deserves. By this means the vessels of a part can be considerably relieved, and thus a most beneficial local effect produced, while the general bulk of the blood is not materially diminished, or the patient injured in any appreciable degree.

b. Some powerful medicinal agents have of late years come into vogue in the treatment of inflammation, which exercise a direct influence upon the heart, diminishing the number of its beats. Of these the most important are *aconite*, *veratrum viride*, and *digitalis*. Tincture of aconite has been found especially useful in the milder and limited forms of inflammation.

Tartar emetic has long occupied a prominent position in the treatment of certain inflammatory affections, and justly so; it exerts a powerful influence over the heart, while at the same time it increases some of the secretions.

c. A class of remedies often of much value, if properly employed, are those which increase the different secretions and thus relieve the blood-vessels, viz., *purgatives*, *diaphoretics*, and *diuretics*. Purgatives must be used cautiously, but it is generally advisable to keep the bowels freely open, and particularly when the blood is loaded with products of decomposed tissues. The best diaphoretic is some form of bath, especially the vapour, hot-air, or Turkish bath. The powerful diaphoretic *jaborandi* has been found useful in some inflammations. Salines are also frequently of much service. Of course these classes of remedies are severally contra-indicated if there is any local inflammation of the bowels, skin, or kidneys.

d. Local treatment.—There are certain important local means of subduing the increased vascular action in inflammation. Among these the most valuable is the *application of cold.* Cold may be applied by means of rags dipped in water or evaporating spirit lotions; irrigation; ice or a mixture of ice and salt contained in a bladder or India-rubber bag. It is in the early stage that this remedy proves most useful, and when the inflammation is quite superficial or affects structures near the surface. *Heat* and *moisture* act very beneficially in some cases, applied in the form of hot-water dressing, poultices, or hot fomentations. In others turpentine fomentations, dry-cupping, mustard poultices, or blisters are valuable. All these act mainly by determining the blood to the surface. The application of belladonna has been much commended in inflammation of superficial parts.

2. The second indication is to endeavour to promote the speedy absorption or removal in some other way of exudation or other morbid products, and thus to restore the implicated organ or tissue to as normal a condition as possible. This will be favoured by attention to many of the points already mentioned, such as rest and position. In order to aid absorption certain medicinal agents are extensively used. Of these *mercury* in some form is very commonly employed. In syphilitic inflammations this drug acts most efficiently, but as a rule it ought to be avoided, or at least used with great caution; a great deal of harm has been and still is done by its indiscriminate use. *Iodine*, especially in the form of *iodide of potassium*, is often of real value. *Liquor potassæ* and the *alkaline bicarbonates* are also serviceable sometimes.

Local measures are frequently followed by excellent results, particularly the employment of various forms of *counter-irritation*, such as blistering, painting with a solution of iodine, the use of irritating liniments, issues, setons, or the actual cautery. *Friction* and *regulated pressure* are in some cases most serviceable, and in practising the former it may be advisable to use absorbent liniments or ointments. Mercurial ointment is much employed in this way.

Absorption may undoubtedly be assisted in some instances by acting freely on the various excretory organs, especially by promoting the functions of the skin by means of baths.

In some cases the products of inflammation cannot be absorbed, and then it may be necessary to have recourse to operations for their removal. In others, what has to be aimed at is to encourage certain acts by which these products are discharged, such as the act of coughing in cases of bronchitis.

3. In the next place the *general condition* of the patient must be attended to:—The various forms of *fever* met with must be treated

according to the principles which will be laid down when considering this subject. If the inflammation is of a *specific* character, particular remedies are called for, such as mercury in syphilis or colchicum in gout. In certain other forms of inflammation also, special medicines have been found most useful, such as tincture of iron in erysipelas, and chlorate of potash in inflammations about the mouth and throat. Diet must be regulated according to circumstances, and it is impossible to lay down any definite rules, so much depending on the part affected, the state of the patient, and other circumstances. Should there be any tendency to depression, nourishing diet and stimulants are called for, often in considerable quantities, and this is especially the case if suppuration, ulceration, or gangrene sets in. Tonics, such as quinine, bark, mineral acids, steel, as well as cod-liver oil, are then also indicated. Of course it is necessary to pay careful attention to all hygienic conditions.

4. Every precaution must be taken against the occurrence of untoward terminations, such as *suppuration*, *ulceration*, or *gangrene*; should either of these occur, however, it must be treated by appropriate measures. The escape of pus must be encouraged or its formation checked; ulceration healed; and the separation of dead parts promoted.

5. It is often necessary to attend to *local symptoms*, these necessarily depending upon the part affected. Among these a prominent one is *pain*. For its relief many of the remedies already considered are very valuable, but the most important drug for this purpose is *opium*. It is exceedingly serviceable in many inflammations in various other ways, such as by inducing sleep, stopping the peristaltic action of muscular tissues, allaying irritability, and probably directly influencing the inflammatory process. It is contra-indicated or must be given with great caution under certain circumstances, viz., if the respiratory organs, kidneys, or brain are involved. Morphia, hydrate of chloral, bromide of potassium, cannabis indica, and other sedatives are also very useful in many cases, for the relief of pain and sleeplessness.

CHAPTER V.

ALTERATIONS IN GROWTH.

I. HYPERTROPHY.

HYPERTROPHY implies an over-growth, and ought to be strictly limited in its meaning to the "increase in an organ or structure of its normal tissue-elements." The tissue may be augmented either from an enlargement of its previously-existing constituents—*simple hypertrophy;* or from the formation of new and additional elements—*numerical hypertrophy* or *hyperplasia.* It must be remembered that an organ is usually made up of several structures, either of which may become hypertrophied, and thus its active functions may be improved or the reverse. For instance, as has been pointed out by Dr. Quain, in the heart either the muscular tissue, the fibrous tissue, or the fat may be increased, and each form is a true hypertrophy of a certain kind. In most cases, however, it is the active tissue of an organ which is increased, and its functions are thereby promoted. Muscle is peculiarly prone to become hypertrophied, both voluntary and involuntary.

ÆTIOLOGY.—1. In the great majority of cases hypertrophy is the result of *an organ or part being called upon to do extra work,* and it is truly a conservative lesion, to ward off evil consequences which might otherwise ensue. Thus, in the case of hollow muscular organs, such as the stomach, heart, or bladder, whenever an obstruction exists at an orifice or elsewhere, interfering with the exit of their contents, the tissues, especially the muscular, almost always hypertrophy. Involuntary muscular tissue is very frequently hypertrophied, and this may be a natural event for a certain definite purpose, of which the pregnant uterus affords an illustration. When the elements of a secretion or excretion accumulate in excess in the blood, hypertrophy of the organ or organs whose function it is to remove them often ensues. Thus if one kidney is unable to perform its functions, the other becomes enlarged and thus does double duty. If either lung is incapacitated from any cause, the opposite one generally becomes hypertrophied.

2. Probably *continued excessive action of an organ due to mere nervous irritation* may lead to hypertrophy. Nervous palpitation of the heart, for example, does in exceptional cases cause permanent enlargement of this organ. It is a familiar fact that voluntary muscles enlarge in proportion to the degree in which they are exercised.

3. *Excess of blood flowing to a part* may unquestionably originate hypertrophy of the structures thus unduly supplied with nutriment.

4. Increase in a particular tissue may result from *the presence of an excess of its formative elements in the blood.* This is illustrated by the large formation of adipose tissue throughout the body in some individuals whose blood contains an excess of fat.

5. Occasionally hypertrophy of certain structures takes place without any obvious cause.

ANATOMICAL CHARACTERS.—Increase in weight is the only necessary result of hypertrophy. Usually there is enlargement of an organ, and sometimes change in shape, but not always. The walls of hollow organs are generally thickened. The tissue involved may be quite natural as regards colour, consistence, and other physical characters; or these may be more or less altered. The newly-formed structure is often prone to undergo degeneration, as happens not uncommonly in the case of the heart, and this leads to further changes in appearance and other characters.

SYMPTOMS.—It frequently happens that hypertrophy of an organ is not attended with any symptoms whatever, especially when it is compensatory. There may be signs of its increased functional activity, of which the patient is also sometimes conscious, and this excessive action occasionally leads to more or less serious consequences. An enlarged organ may also mechanically interfere with neighbouring structures. Physical examination often reveals hypertrophy when it cannot be detected in any other way.

TREATMENT.—Should anything be required in the way of treatment, the indications are to get rid of the cause of the hypertrophy, if practicable: to reduce the functional activity of any organ affected; to diminish the supply of blood, or to alter its composition; and to use such remedies as are known to influence the growth of any special organ or structure.

II. ATROPHY.

ATROPHY is the reverse of hypertrophy, and implies a diminution in the *size* or *number* of normal tissue-elements, the former being termed *simple*, the latter *numerical* atrophy, but both forms are frequently met with in combination.

Degeneration often accompanies atrophy, and when structures are actually destroyed and disappear, they must of necessity pass through a process of decay during their removal—*necrobiosis*. Atrophy may be *general*, involving all the tissues and fluids of the body, some, however, more than others; it may be limited to a *particular class of structures*, such as the muscular or glandular; or it may only affect a *special organ*, or even *one of its constituent tissues*, *e.g.*, the heart, liver, or kidney.

ÆTIOLOGY.—1. Whatever interferes with the *proper nutritive qualities of the blood* will give rise to general wasting to a greater or less degree. Hence this may arise from direct loss of blood; deficiency in the quantity or quality of the food; and diseases which interfere with digestion and assimilation, as well as those which lead to the excessive consumption or waste of the nutritive elements of the blood, such as Bright's disease, diabetes, prolonged suppuration, or phthisis. In cancer there is frequently an extraordinary degree of wasting, involving also the internal organs.

2. Combined with the foregoing cause, or acting alone, there is often *increased waste of tissue*, which cannot be repaired, as is observed in fevers and many other diseases. In some instances atrophy from this cause is limited to one organ, of which acute atrophy of the liver affords an illustration.

3. The *vitality* and *nutritive activity* of the tissues generally may be impaired, or only those of some particular part or organ, and thus general or local atrophy may result. This is in many instances the normal course of events, associated with a natural impairment or cessation of functions, as, for example, in *senile* atrophy, of which it is an important element, as well as in the wasting of organs or structures, such as the thymus gland, spleen, and lymphatic glands, which at a certain period of life become atrophied because their functional activity is at an end. The same thing is seen in the rapid diminution in the size of the uterus after delivery. In other instances the impairment of vitality is due to some previous disease, such as inflammation. Excessive use on the one hand, or deficient exercise on the other, may produce the same effect. There

can be no doubt but that if certain organs are exercised unduly they may waste, *e.g.*, the brain or testicle; while examples of the opposite condition are found in the wasting of the muscles of paralyzed limbs, of bone after amputation, or of nerves after their connection with the cerebro-spinal axis has been severed.

4. An important cause of atrophy is a *deficient supply of arterial blood*, in whatever way this may be brought about, whether by something directly interfering with its entrance into a part, or by over-loading of the veins in long-continued mechanical congestion. To some extent this will explain *senile* atrophy, the heart and arteries having undergone degeneration, and the circulation being consequently impeded. It is in the production of *local* atrophy, however, that this cause mainly acts, and any structure may be affected if the supply of blood is not adequate to the demand, provided this is not so deficient as to lead to gangrene.

5. *Direct pressure* upon an organ or tissue may occasion atrophy, partly, but not entirely, on account of the interference with the vascular supply thus brought about. The pressure of pericardial thickenings upon the heart occasionally causes atrophy of this organ, but the best illustration of this form of atrophy is that which follows the continued pressure of aneurisms and other tumours, by which bones and other structures are often extensively wasted.

6. It has long been known that the *nerves* exercise an important influence over nutrition, and hence when any nerve is paralyzed, atrophy is liable to follow in the structures which it supplies. This is partly to be attributed to the resulting cessation of functions; partly to the influence exercised on the supply of blood through the vessels; but to some extent to the direct control which nerves exercise over the process of nutrition.

7. Certain *medicines*, *e.g.*, mercury, iodide or bromide of potassium, and alkalies, when administered for some time have the power of causing the absorption and wasting of particular organs or tissues. This power is made use of for the purpose of promoting the removal of morbid products.

8. Some forms of atrophy are met with the cause of which is at present not satisfactorily decided, *e.g.*, progressive muscular atrophy.

Anatomical Characters.—In *general atrophy* or *marasmus* the entire body is more or less wasted, though this may be more evident in some parts than others. The wasting may terminate in the most extreme emaciation. The fat is first removed, then follows muscular tissue, and subsequently other structures become atrophied, as well as the elements of the blood and the internal organs. There is corresponding loss of weight, both as regards the whole body and particular organs. In a case of cancer attended with much emaciation which came under my notice, the heart only weighed 3½ ounces. The tissues generally feel flabby and wanting in healthy tone.

Local atrophy is necessarily attended with diminution in weight of the organ or part involved, and there is usually a lessening in dimensions as well, though this is not invariably the case, and there may even be apparent enlargement, as is sometimes observed in atrophy of bone. The physical characters of a wasted organ are generally altered. It appears paler than normal and less vascular, while its consistence is changed. Frequently it feels unusually dry and firm, and may be remarkably tough, because its fibrous element remains longest unaffected; wasted structures may, however, lose in consistence and become softened, while bone is in some instances much rarefied and very brittle, so that it crackles and breaks down readily under pressure. Atrophy occasionally leads to the entire removal of a structure or even of an entire organ, so that not a trace of it remains.

It is needful to warn against mistaking other organic changes which lead to diminution in the size of organs for mere atrophy; and to call attention to the fact that congestion or other conditions may obscure the loss of weight which characterizes this process.

SYMPTOMS.—The appearance of the patient constitutes the most prominent clinical sign of *general marasmus*, but it must be remembered that the face may present a tolerably healthy aspect, while the body is much emaciated. The degree of wasting can only be made out accurately by weighing the patient from time to time, and this is especially required in the less-marked cases. It may be rapid or gradual in its progress. As a rule the patient experiences a sense of weakness, corresponding and in proportion to the emaciation, but this is not always the case. The muscles usually feel flabby and deficient in firmness. There may be signs of impaired activity on the part of certain organs, particularly the heart.

When an organ becomes atrophied, there may be no signs whatever of this condition, or more or less serious symptoms may result from interference with its functions. Local atrophy can also frequently be discovered by physical examination, as in the case of the heart and lungs.

TREATMENT.—In the treatment of *general atrophy* the indications are:—1. To endeavour to remove the cause, and to cure the disease with which it may be associated. 2. To repair the waste by introducing into the system a due supply of nutritious food, in such form as it can be best assimilated. Milk and cream are of great service in many cases, as well as prepared amylaceous and other kinds of food; alcoholic stimulants in moderation are also often very valuable. If from any cause food cannot be swallowed, it is frequently of great consequence that it should be administered by means of the stomach-pump or enemata. 3. To attend to the digestive organs, if required, giving remedies to improve the appetite or to promote or assist digestion. 4. To regulate the hygienic conditions, change of air being in many cases an important part of the treatment. 5. To administer medicines either with the view of curing the disease; of checking any pathological process which may be the cause of wasting, such as fever; or of giving tone to the system and assisting in its nutrition. Cod-liver oil is a most valuable remedy in many forms of marasmus.

In *local atrophy* attention must be mainly directed to improving the nutrition of the affected part; at the same time guarding against making any undue call upon it, or, on the other hand, as in cases of atrophy from paralysis, endeavouring to rouse the involved tissues into activity, and thus to promote their growth and vitality.

CHAPTER VI.

DEGENERATIONS.

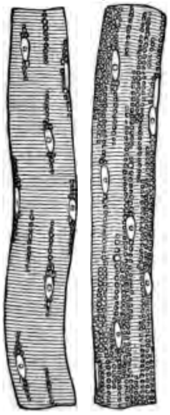
STRICTLY speaking a *degeneration* is a *retrograde metamorphosis*, and implies the conversion of some tissue into one less organized than itself, which is incapable of performing efficiently its normal functions. This may result either from an immediate change in its albuminoid components; or from a molecular absorption of the structural elements, and their replacement by others lower in the scale. The term *degeneration* is, however, also applied to certain pathological processes in which a new material derived from the blood is deposited in the midst of the original elements of a tissue, which frequently leads to their absorption, and may ultimately replace them entirely. To these two kinds of so-called degeneration the terms *metamorphosis* and *infiltration* are respectively applied. They comprehend pathological changes of the utmost importance, which need to be severally considered in some detail.

I. FATTY DEGENERATION.

This includes FATTY METAMORPHOSIS and FATTY INFILTRATION, each of which requires separate notice.

1. FATTY METAMORPHOSIS.—The fact of the direct conversion of the albuminoid constituents of tissues into fat has been established by observation and experiment, and it is a frequent pathological occurrence, being one of the natural events of decay in old age, when it often leads to serious consequences. The process may take place in connection with cells or fibres. The fat is usually deposited in a granular form, but ultimately it may accumulate into masses or run into drops of oil. The granules are recognized by their dark and distinct outline; peculiar refractive power upon light; and solubility in ether. Fatty metamorphosis can be best studied by a description of the process as observed in certain individual tissues.

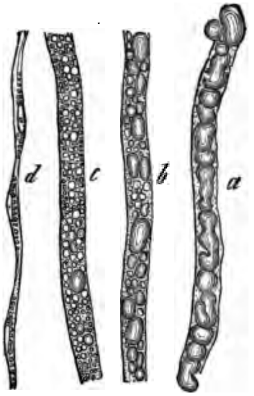
FIG. 3.



Fatty degeneration of fibres of striped muscle, $\frac{1}{300}$. (Rindfleisch).

Muscular tissue.—Voluntary muscles may become the seat of fatty change, of which a striking example has come under my notice, where almost the whole of the muscles of the thigh on one side were converted into fat, without any alteration in their general size or shape, or in the arrangement of their fibres. The subject, an old woman, had been bed-ridden for several years. It is in the fibres of the heart, however, that this degeneration is most commonly observed. Under the microscope these fibres are seen in the early stage to be somewhat dim as regards their transverse striæ, owing to the presence of a few minute fat granules, arranged either in transverse or longitudinal lines, or in an irregular manner. Ether dissolves the fat and brings the striæ again into view. The increase in the number and size of the granules causes them to become more and more obscure, until eventually every trace of muscular fibre disappears, and its place is occupied by fat molecules and oil drops. Where sarcolemma exists, this may ultimately rupture and the fat become scattered about. The cells of involuntary muscular tissue are also liable to undergo fatty change, granules gradually filling them up and concealing their nucleus, complete destruction finally ensuing. The conversion of muscle into adipocere after death is a form of fatty degeneration.

FIG. 4.



Fatty degeneration of double-bordered nerve fibres in the peripheral part of a divided cerebro-spinal nerve. *a.* After three days have elapsed; *b.* After a fortnight; *c.* After three weeks; *d.* After two months, $\frac{1}{300}$. (Rindfleisch).

Blood-vessels.—The arteries are very prone to fatty degeneration as age advances, which may start as an immediate change in the cells of the inner coat or in the muscular coat, or be associated with the condition named *atheroma.* At last the tissues may be more or less destroyed and carried away by the blood-current, leaving uneven erosions on the inner surface of the vessels. The capillaries are also apt to undergo a fatty change.

The *nerve-tissues,* both cells and fibres, are subject to fatty degeneration, becoming the seat of much molecular fat and finally breaking down. This is well seen in softening of the brain or spinal cord.

The following may be mentioned in further illustration of fatty degeneration in cells. The so-called "compound inflammatory globules" or "exudation-corpuscles," as well as pus-corpuscles, are merely the result of the conversion of the contents of cells, either normal to the part or which have migrated from the blood, into granular fat. A large number of these originate in cellular-tissue corpuscles. In the epithelium of the renal tubes, as well as in the cells of the liver, supra-renal capsules, and lymphatic glands, fatty degeneration also occurs, while the "arcus senilis" is due to the same process in the cells of the cornea. Most organs in their natural decay undergo this change, and it is further exemplified in the formation of many secretions; in the production of the corpus luteum in the ovary; and in the degenerative changes which the placenta undergoes on the approach of the full period of pregnancy. Morbid growths, such as cancer, tubercle, and various tumours, are likewise subject to fatty metamorphosis.

When cells undergo fatty degeneration, they often enlarge and become more spherical and distended. The granules first appear at a distance from the nucleus, scattered irregularly; they then increase in number and size, obscure the nucleus, and finally render it quite invisible. The cell-wall is often ruptured or absorbed, leaving merely an accumulation of granular fat, which frequently separates into its constituent particles, owing to intermediate liquefaction.

Caseation; *Caseous* or *Cheesy Degeneration.*—These terms have come into considerable prominence of late years, and are used to signify the conversion of various structures into a kind of soft, dryish, cheesy-looking substance, of yellowish-colour. It is really a process of partial fatty degeneration with drying, and the material formed is found to consist of withered cells, fat granules, partially saponified fat, and crystals of cholesterin. Caseation generally occurs in connection with some morbid product, or where there is a great accumulation of cells pressing closely upon each other, and it is especially met with where vessels are few, so that the tissue is dry. Pulmonary phthisis affords some of the most frequent examples of caseous degeneration, but by no means of necessity associated with tubercle. It is also often seen in scrofulous lymphatic glands, cancer, and chronic abscesses. Ultimately a more or less creamy or puriform-looking fluid substance may be produced, or a kind of fatty emulsion, which may be completely removed by absorption or in other ways; or it may become encapsuled by some dense tissue and finally calcify. Many pathologists regard caseous material as a morbid poison, which, after absorption into the blood, is capable of originating tubercle by an infective process.

Ætiology.—Some interference with nutrition is in the great majority of cases the immediate cause of fatty degeneration, and it may result from either of the conditions mentioned as capable of originating atrophy. Possibly the presence of an excess of fat in the blood may occasion fatty decay, but the causes to which it is usually due are:—1. Senile decay, during which most of the tissues undergo degeneration. 2. Deficient supply of arterial blood to a part, from obstruction, changes in the vessels, or external pressure upon them. 3. Some general disease lowering vitality, such as phthisis or cancer. 4. Congestion, inflammation, very rapid development of a tissue, or undue exercise of its functions, whereby its vitality is disturbed.

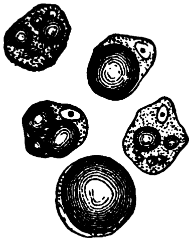
Anatomical characters.—The changes induced by fatty degeneration are usually quite obvious if the process is at all advanced, but in less marked cases it can only be detected by the aid of the microscope. There is an alteration in colour, the affected tissue becoming usually paler than normal, and assuming a yellowish or brownish tint; this is well seen in muscular tissue, but in some instances, as in softening of the brain, the colour ranges from white to red according to circumstances. A tendency towards opacity is also evident. One of the most marked changes is a diminution in the consistence of the affected structure, which varies from a slight degree of softening, the tissue breaking down under pressure or tearing more easily than in health, to its conversion into almost a fluid pulp. All vital properties, such as elasticity or contractility, are at the same time impaired or lost, as well as the power of resistance. When the process is advanced, the affected tissues may have an oily feel, and ether will dissolve out a considerable quantity of fat.

The remote pathological consequences of fatty degeneration are often very important. For instance, the affected structures are liable to give way and rupture, as happens sometimes in the case of the heart and vessels. Arteries may also become the seat of aneurism; or by diminishing the supply of blood to structures which depend on them for their nutrition, ultimately lead to their degeneration likewise.

SYMPTOMS. There may be no clinical indications whatever of fatty degeneration. This may be due to the fact that the structure involved is of but little consequence, but even when an important organ is implicated, such as the heart, the process may go on insidiously until it becomes very marked, being only revealed by some sudden grave symptoms. The phenomena to be looked for as indicative of fatty degeneration are those significant of impaired functional activity on the part of the affected structure. Physical examination may also reveal the change, as in the case of the heart and vessels.

2. FATTY INFILTRATION or GROWTH.—This is a process essentially distinct from *fatty degeneration*, there being no necessary change in the elementary structures themselves, but merely a deposit of fat from the blood within the cells of the part affected, and this infiltrates the tissues to a variable extent. It might, in fact, be described as a *fatty hypertrophy*. The deposit occurs in the form of oil-drops, which ultimately run together, completely obscuring the other contents of the cells without of necessity destroying them. In course of time the tissues may degenerate from the mere pressure of the infiltrated fat, and may even finally become absorbed. The best examples of fatty growth are found in the increase of ordinary adipose tissue observed in some individuals, subcutaneous as well as around internal organs, constituting *general obesity*; in connection with the heart; and in the cells of the liver. In the two former instances the connective-tissue cells become filled with fat; while in the liver the hepatic cells are more or less loaded with drops of oil, which cause them to become larger and more spherical, and hide their contents.

FIG. 5.



Liver-cells, infiltrated with oil, $\frac{1}{300}$. *(Rindfleisch).*

ÆTIOLOGY.—1. *Excess of fat in the blood* is a common cause of fatty infiltration, which is then usually indicated by general obesity, as well as by changes in organs. This may result from consumption of too much fat or of aliments which contribute to its formation; from a deficiency in the amount of exercise taken, and general luxurious habits; or from both these causes combined. There is also a diminution in the ordinary waste of fat under these circumstances.

2. In certain affections attended with much emaciation, certain organs are prone to become the seat of fatty infiltration, especially the liver. This is best seen in phthisis, and is supposed to be due to the absorption of the general fat and its consequent accumulation in the blood, from which it is afterwards deposited in the liver.

3. Undoubtedly *interference with the respiratory process* may lead to fatty infiltration, because the fat is then not properly consumed, and thus its not infrequent occurrence in connection with lung and heart affections will be partly accounted for.

4. *Local inactivity* may be the cause of fatty infiltration. Thus it may be observed in voluntary muscles which are paralyzed or otherwise rendered inactive.

ANATOMICAL CHARACTERS.—Fatty infiltration may occasion enlargement of organs and some alteration in form, there being a tendency to roundness of margins and general outline. The colour also becomes paler, and may be similar to that of adipose tissue. The principal changes observed are that the affected structure is softened, and has the doughy feel characteristic of ordinary fat; while evidences of the presence of more or less oil may be obtained, either by the finger, the knife, blotting-paper, or ether. Microscopic examination reveals the appearances described above.

SYMPTOMS.—*General obesity* is usually evident enough in the appearance of the individual. The subjects of this condition feel languid, are deficient in bodily activity and vitality, disinclined for exertion, and easily tired. The muscles are wanting in tone and firmness. Digestive disturbances are common; the cardiac action is easily disturbed; and there is shortness of breath on exertion. As a rule the mental faculties are also dull and inactive. In extreme cases the patient experiences great distress and discomfort, and is incapable of any exertion.

Fatty infiltration of an organ may be indicated by impairment of its functions; as well as by the results of physical examination.

TREATMENT.—In the treatment of *fatty degeneration* all that can be done is to improve the general nutrition, as well as that of the affected structure, by the aid of good food, tonics, and cod-liver oil. Care must be taken to prevent any undue strain upon important structures which are the seat of this change, such as the heart or vessels.

General obesity must be treated by restricting and regulating the diet, especially limiting those aliments which contribute to the formation of fat; by making the patient avoid sedentary habits and take sufficient exercise; by keeping the bowels acting freely, and employing baths to promote the action of the skin; and in every respect regulating the habits of the patient. Medicines are of but little service, but liquor potassæ seems to be of use in some cases. Local fatty infiltration requires no special treatment.

II. MINERAL OR CALCAREOUS DEGENERATION.—CALCIFICATION.—PETRIFACTION.

It is important to distinguish *calcification* from true *ossification*, with which it is often confounded. There is no formation of bone, but merely an infiltration of the tissue involved with particles of calcareous matter. These assume the form of very minute molecules, chiefly deposited irregularly between the histological elements, but partly in their interior as well. Under the microscope they look like dark, opaque, irregular particles under transmitted light, and when aggregated have a glistening aspect. They often resemble fat in appearance, but may be distinguished by their solubility in dilute mineral acids, this being frequently attended with effervescence and the formation of small bubbles of gas, owing to the decomposition of earthy carbonates. The deposit occurs first immediately around small vessels, where these exist, but ultimately it may increase so as to form irregular patches or concretions of considerable extent. Chemically it is made up chiefly of calcic and magnesic phosphates and carbonates, but other salts are also present, and the composition is not uniform in all structures.

Calcification is particularly prone to occur in tissues which have lost their vitality, and which have previously undergone other forms of degeneration, especially the fatty change. It is in fact very commonly the final stage of the degenerative process, after which no further alteration can take place. Among its most frequent seats are the *arteries*, and the *valves* and *orifices of the heart*, and it is in connection with these structures that its injurious effects are most obvious. Calcareous deposit, however, may be met with in many other tissues, viz., in fibrous or fibro-serous membranes, *e.g.*, the pericardium, dura mater, or tunica albuginea; in the walls of hollow organs, such as the gall-bladder or stomach; in the pia mater and choroid plexuses of the brain, constituting "brain-sand;" in cartilage, muscle, and nerve tissues; in various organs and glands, such as the kidneys, lungs, absorbent glands, thyroid, prostate, and pineal gland; and in connection with different morbid products, as tubercle, cancer, inflammatory exudations, fibrinous deposits from the blood, chronic abscesses, and tumours of all kinds.

ÆTIOLOGY.—1. Calcification is usually associated with *deficient vitality* and *nutritive activity*, either general, such as attends advanced age; or local, such as is met with in connection with morbid products, being then dependent upon an insufficient supply of blood, with slowness of its circulation. As already stated, it is frequently the termination of other atrophic and degenerative processes. With regard to the immediate cause of the accumulation of calcareous matter, it is supposed to be due partly to the inability of the tissues to take up the nutritive fluid in which the salts are dissolved; partly to the precipitation of these salts, because the carbonic acid which holds them in solution escapes, owing to the stagnation of the fluid.

2. Occasionally calcification is dependent upon *the presence of an*

excess of calcareous salts in the blood. This may arise in connection with diseases of bone, such as mollities ossium or extensive caries or necrosis, in which its salts are rapidly absorbed, and "metastatic deposits" are afterwards formed in other parts, often involving many structures and organs. An interference with the urinary secretion may also lead to this condition, the salts not being properly eliminated, and when this happens the kidneys are particularly apt to become the seat of calcareous deposit.

ANATOMICAL CHARACTERS.—The deposit of calcareous matter occasions more or less hardness, stiffness, roughness, and rigidity, often combined with brittleness. There is a gritty sensation on section, and when membranes are involved they can frequently be broken up with a crackling noise. In some cases stony masses of some size are formed. Now and then a kind of chalky fluid is produced, or a substance like cement. The most injurious consequences result from the change in size and shape of structures; the roughness and interference with free movement, and with the functions of elasticity and contractility; and the brittleness which attend calcification. Thus, in the case of arteries, it narrows their calibre, makes them rough and rigid, destroys their elastic and muscular tissues, and renders them liable to be easily ruptured. Hence it leads to insufficient supply of blood to parts, with consequent atrophy or gangrene; also to the formation of internal clots, or to hæmorrhage. In connection with the valves and orifices of the heart it causes serious obstruction and interference with their normal functions. In some cases, however, calcification is distinctly a favourable result, and indicates the cessation of injurious morbid processes. It is, in fact, in such instances a practical cure, and the calcified substance may remain for many years inert, without causing any disturbance. This is well seen in connection with phthisical consolidations and scrofulous lymphatic glands. A case fell under my notice some years ago, where, in a highly scrofulous young man aged 21, the whole of the absorbent glands within the abdomen were converted into calcareous masses, and had evidently been in this condition for many years without leading to any inconvenience, the patient dying from an entirely independent acute illness.

SYMPTOMS.—There may be objective signs of calcification, as in the case of the arteries. Various symptoms arise from the injurious effects of the process mentioned above. Particles of calcareous matter from internal parts, *e.g.* the lungs, may be discharged externally. Frequently, however, petrifaction is a decidedly favourable event, and is indicated by the cessation of symptoms previously associated with some active disease.

III. FIBROID DEGENERATION.

Tissues are sometimes gradually changed into a tough, inelastic material, made up of imperfect fibres resembling those of fibrous tissue. There is no apparent exudation to any extent, but a hyperplasia of the cellular-tissue elements occurs. The affected part becomes more or less opaque, whitish, thickened, and stiff, sometimes being hard and rough. The fibro-serous and serous membranes often present this change, in the form of thickened patches, which are well seen in connection with the pericardium. It also affects other structures, such as the coverings of organs, as that of the spleen or liver; the sheaths of vessels; or the valves, tendinous cords, and muscular tissue of the heart. The functions of the involved parts may be much impaired. Ultimately they may become calcified. This fibroid degeneration results from pressure and friction; from repeated traction; or sometimes from long-continued congestion. It is not always easy to draw a line between the effects of this process and those of chronic inflammation, and some pathologists consider that the latter always precedes and is the cause of the fibroid change.

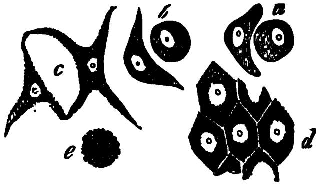
IV. Pigmentary Degeneration. Pigmentation.

General or local changes of colour in tissues may result from various causes. As illustrations may be mentioned the colour due to jaundice or local staining by bile; the bronzed hue observed in Addison's disease; the colour produced by the action of the intestinal gases or of those set free in mortifying parts; and that brought out by the prolonged administration of nitrate of silver. What is at present under consideration, however, is the deposit of actual pigment in connection with various textures; and it is necessary to discuss the origin, nature, and characters of the different kinds which may be met with.

1. In the great majority of cases in which pigment is found, it is derived from the colouring matter of the blood, which undergoes certain changes. This colouring matter may be present in some localized part, either from its mere transudation through the coats of the vessels; from the migration of red corpuscles; from actual hæmorrhage having taken place; or from capillary stagnation. At first it is diffused and stains the tissues which it involves, especially the cells, colouring their contents but leaving the nucleus and envelope unaffected. After a while the colour changes, assuming a variety of tints, such as yellow, yellowish-brown, brown, reddish-brown, dark-brown, grey, or black; the exact hue depends much upon the length of time the pigment has been formed, and the tissue in which it is present. At the same time it separates into minute molecules, or crystals, or both, which are found within or outside the cells. The molecules may aggregate into larger granules; they are round or irregular in shape, well-defined, opaque or sometimes glistening in appearance. The crystals are in the form of minute oblique prisms, needles, or plates, which present various tints of yellow, red, brown, or black, and they have a shining aspect. These particles are very persistent. They resist the action of acids, and are not easily destroyed; water, alcohol, and ether do not affect them, but they are dissolved by strong alkalies, forming a red solution, while concentrated mineral acids bring out a series of changes of colour. Chemically the pig-

ment is supposed to consist of *hæmatoidine*, but when it becomes black it is named *melanin*. Examples of these changes in blood-pigments are frequently met with in connection with cerebral apoplexy; in pulmonary congestion or hæmorrhage; in subcutaneous extravasations; and in the formation of the corpus luteum in the ovary. The alterations in the colour of the "rusty expectoration" of pneumonia during the progress of this disease are due to the same cause. In certain affections the blood itself contains corpuscles enclosing a quantity of black pigment. This occurs in the rare disease called *melanœmia*, as well as after prolonged attacks of ague, when the spleen becomes enlarged and contains an abundance of the same pigment, which is supposed to be absorbed into the blood. It is, however, originally derived from the blood-pigment. The same condition is observed in melanotic tumours. Occasionally the minute portal vessels of the liver become filled with black pigment.

FIG. 6.



Cells in various stages of pigmentary infiltration; (*a. b. c. e.*), from a melanotic cancer; *d.* Pigmented epithelium from the vessels (same specimen), $\frac{1}{300}$. (*Rindfleisch*).

In some instances pigment is supposed to be directly formed and secreted in certain cells, but here again the blood must be looked upon as its ultimate source. This is presumed to occur especially in growths connected with tissues which normally contain much pigment, such as the choroid coat of the eye.

Allusion may here be made to the so-called *brown atrophy of the heart*, in which condition granules of brownish-yellow or blackish pigment form, the muscular fibres being at the same time atrophied, as well as often the seat of fatty change.

2. An important source of pigmentation in connection with the lungs and bronchial glands is the inhalation of certain substances along with the air breathed. All persons are liable to inhale small particles of carbon, the product of imperfect combustion, and this occurs especially in large towns and manufacturing districts. Hence it is found that the lungs become darker as age advances. It is, however, in the lungs of those who, owing to their occupation, are exposed to the constant breathing of air containing various minute particles suspended in it, that the most marked alterations are observed. Colliers inhale fragments of coal, and their lungs become ultimately perfectly black. Miners, stone-masons, and others are also subject to changes in the colour of these organs from the inhalation of solid particles.

The carbon or coal exists in the form of minute granules, which resist all chemical change, and these, after entering the small bronchi and air-cells, somehow penetrate the tissues, passing into the epithelium-cells, as well as into the tissue between the lobules and around the bronchi, where they lie either free or enclosed in the connective-tissue corpuscles. They are taken up by the lymphatics and conveyed to the bronchial glands, which soon become quite black also. In the matter which is expectorated, abundant pigment is seen within the cells which it contains, and the sputa may be perfectly black. The change of colour in these cases is, however, not entirely due to the direct deposit of material from without, but partly to the irritation caused by this material setting up inflammation, with stagnation of blood, the pigment of which undergoes the usual alterations.

V. Mucoid Degeneration.

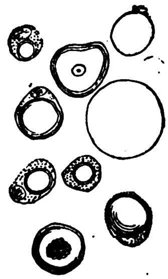
Some tissues occasionally undergo a process of softening or liquefaction, to which this term is applied. They become changed into a mucilaginous substance, colourless and homogeneous, which yields *mucin*. In fact they seem to return to their original fœtal condition. The change may take place extensively or in limited spots, in which, being surrounded by healthy tissue, it may give rise to an appearance of cysts. The intercellular tissue is most affected, but sometimes the cellular elements become involved in the degeneration. This degeneration is met with in cartilage, bone, serous membranes, and in the choroid plexuses of the brain. Some tumours are of a *mucoid* structure when first formed, and many others may undergo this change to a greater or less degree.

VI. Colloid Degeneration.

The substance formed in colloid degeneration is of a jelly- or glue-like consistence, glistening, transparent, and devoid of colour. It is derived from the albuminoid tissues, and differs from *mucin* in that it has sulphur entering into its composition, and is not precipitated by acetic acid. This degeneration also involves the *contents of the cells* themselves, and not the *intercellular substance*.

Ultimately the colloid substance may form considerable masses from coalescence, which often appear to be contained in cystic cavities. New growths sometimes start as *colloid tumours*, and other tumours are liable to the change. Formerly all colloid tumours were looked upon as being of a cancerous nature, but it is now recognized that non-malignant tumours may also become the seat of this degeneration. Enlarged thyroid glands and lymphatic glands occasionally contain colloid material.

FIG. 7.



Cells undergoing colloid degeneration. From a colloid cancer. (*Rindfleisch.*)

VII. LARDACEOUS DISEASE.—ALBUMINOID INFILTRATION OR DEGENERATION.—AMYLOID DEGENERATION.—WAXY DISEASE.

By these names among others a very important morbid condition has of late years been recognized. There is still much uncertainty with reference to several points connected with this subject, but the following account conveys tolerably complete information as to the present state of knowledge.

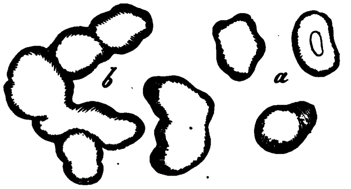
ÆTIOLOGY.—Albuminoid infiltration is almost invariably a consequence of some previous disease, which in the great majority of cases is attended with *long-continued and excessive suppuration*, but the experience of many observers has proved that this is certainly not absolutely necessary, and in the worst case which ever came under my notice there had been no suppuration. The chief individual diseases with which this morbid condition is associated are:—*a.* Caries or necrosis of bones, and rickets. *b.* Syphilis, especially if it has caused disease of bones with considerable suppuration, or if much mercury has been given. Children who are congenitally syphilitic may be the subjects of albuminoid disease. *c.* Chronic pulmonary phthisis, or other lung-affections attended with much purulent expectoration. *d.* Chronic empyæma, especially fistulous. *e.* Extensive ulceration of the intestines. *f.* Pyelitis and some other kidney affections.

Albuminoid disease has also been attributed to prolonged ague or exposure to malarial influence.

ANATOMICAL CHARACTERS. 1. *Characters of the Albuminoid material, and objective changes in the affected tissues.*—The material, the presence of which in certain tissues is characteristic of albuminoid disease, is pale, structureless and homogeneous, and at first nearly transparent. It is not prone to decomposition, and is unaffected by most chemical agents, but yields certain characteristic reactions. When a watery solution of iodine is applied to the affected tissue, a deep reddish-brown or mahogany colour is brought out, but this is not invariable even when the disease is advanced, and it may be of more service in indicating a slight degree of the change, especially when the solution is applied to microscopic sections. The subsequent addition of a drop of strong sulphuric acid may develope a violet or dark-blue colour, but this further test, which is recommended by Virchow, is not easily obtained and is unnecessary. The albuminoid substance may undergo a granular or fatty degeneration, and it is also said that it sometimes tends to contract and to become changed into fibrous tissue.

When an organ or tissue is the seat of marked albuminoid disease, it presents certain striking characters. The organ is enlarged, sometimes to a great degree, but without any irregularity in form or outline, the surface being quite smooth, and the margins inclined to be rounded. The weight is proportionately increased; the specific gravity is high; and the organ feels heavy, solid, and firm. It may be cut into regular fragments, quite smooth and presenting sharp margins; or very thin slices may easily be removed. It can also be torn into pieces, while the consistence is peculiar, presenting a combination of toughness and resistance with elasticity, resembling somewhat that of wax or wax and lard combined—hence the names *waxy* and *lardaceous*. A section is dryish, paler than normal, anæmic, and presents a glistening and translucent aspect, being quite smooth, uniform, homogeneous, and compact. In many instances, however, the mischief has not extended to such a degree as to alter much the general physical characters of organs; and it may be limited to the vessels or to certain spots, as is well seen in the so-called "sago-spleen," in which the material is confined to the malpighian corpuscles. In still less advanced cases the change may only be detected by examining sections of the affected tissue under the microscope, and to these, well-washed, the iodine test may be applied. The minute arteries and capillaries are almost always first involved, especially their muscular coat, and the cells of their inner coat. The walls become thickened, the channel is narrowed, and on section the vessels remain patent, while they assume a compact, translucent, shining appearance, so that they come to resemble silvery cords or threads. After a time the material extends to the cells and intercellular tissues, enlarging the former and making them more spherical, at the same time displacing their normal contents, the nucleus being ultimately destroyed. The cells then coalesce; and the whole structure presents finally the peculiar glistening appearance mentioned above. It is supposed by some that the substance makes its way directly through the walls of the vessels, and afterwards extends into the tissues around.

FIG. 8.



Liver-cells infiltrated with amyloid matter. *a*. Isolated cells; *b*. A fragment of the secreting network in which the boundaries of the individual cells have ceased to be visible. (*Rindfleisch*).

2. *Organs and tissues involved.*—Albuminoid disease is particularly liable to affect small arteries and capillaries, cells, and involuntary muscular fibres. Any organ or tissue in the body may be implicated, and usually several organs are involved at the same time. The liver, spleen, kidneys, and absorbent glands are most frequently affected, but other structures are also attacked sometimes, such as the stomach and intestines, supra-renal capsules, bones, voluntary muscles, brain and spinal cord and their membranes, tonsils, serous membranes, heart, lungs, pancreas, uterus, and bladder; morbid deposits, *e.g.*, inflammatory exudations, tubercle, or cancer, may also present the albuminoid change. In some cases, when it follows disease of bones, it begins in the neighbouring lymphatic glands. In many of the organs above-mentioned the disease seems to be limited to the minute vessels.

PATHOLOGY.—Various theories have been held as to the *nature* and *origin* of the morbid material characteristic of albuminoid degeneration. Virchow, on account of its chemical reactions, formerly considered the substance to be allied to starch or cellulose —hence the term *amyloid;* others believed it to be a form of cholesterin. These views have, however, been entirely disproved, and that commonly adopted at present is, that the material is of an *albuminoid* nature, being allied to albumen and other protein elements. The results of chemical analysis show that at any rate it is a nitrogenous compound. Dr. Dickinson affirms that organs in which it exists are deficient in alkaline salts, and this observer has advanced the view that the substance consists of *de-alkalized fibrin.* Marcet found that the affected structures were deficient in potash and phosphoric acid, but contained excess of soda and chlorine. With regard to the *origin* of the albuminoid material, two distinct theories are held, viz., that it is the product of some *local degeneration* or *metamorphosis* of albuminous tissues; or that there is a *direct deposit* from the blood, in consequence of some alteration in this fluid, which deposit infiltrates the tissues. Nothing of the nature of this albuminoid substance has, however, been detected in the blood, and therefore the presumption is that it is modified after it escapes from the vessels. Dickinson thinks that the fibrin of the blood is deprived of its alkali, as the result of prolonged suppuration, and that it is then deposited. Dr. Grainger Stewart strongly advocates the *degeneration-theory,* and calls attention to the distinction between the waxy degeneration proper, and the secondary deposit of fibrinous material which results from it.

SYMPTOMS.—Only a few general remarks need be made here, as the clinical signs of albuminoid disease will again be described in connection with individual organs. It is not always easy to make out what symptoms are due to the original affection, and what to the albuminoid disease. Nutrition is impaired, and the patient is emaciated, often extremely so, at the same time becoming pale and anæmic, and presenting a peculiar transparency of tissues, or a waxy look. There is great debility in many cases, with a tendency ot syncope. Œdema of the legs is often observed, due to weakness of the tissues and anæmia. With regard to the various organs, when either of these is the seat of albuminoid disease, its functions are interfered with more or less, local symptoms are developed; while certain organs are frequently obviously enlarged, and present well-defined characters on physical examination.

TREATMENT.—This must be directed in the first place to the primary disease, suppuration being checked, or any other condition which is causing the albuminoid degeneration being attended to. At the same time the general health must be improved by good diet, hygienic measures, tonics, iron, and other remedies which may be indicated in particular cases. The administration of the *syrup of iodide of iron* is certainly often attended with considerable benefit, if persevered in for some time.

SECTION III.

THE remainder of this work is chiefly devoted to the consideration of individual diseases. Much controversy has been carried on with regard to the NOMENCLATURE and CLASSIFICATION of diseases, and many systems have been proposed. The arrangement adopted in the following chapters is mainly in accordance with that recognized by the College of Physicians, most of the complaints being described as they come under either of the groups mentioned below, though it will be expedient to deviate from this arrangement in some instances.

I. GENERAL DISEASES.—These affect more or less the entire system, and though local morbid conditions are often present, they arise secondarily, as the necessary or accidental consequence of the general disorder. Under this class are included:—

(A.) The various *idiopathic fevers*, and certain other affections which are due to the action of a *specific poison* on the system, introduced from without. *Ex.* Scarlatina, small-pox, ague, hooping-cough, diphtheria, hydrophobia.

(B.) *Constitutional diseases.*—These maladies are dependent upon some unhealthy condition of the blood, or so-called *cachexia*, which, however, is usually revealed by local lesions, often developed in several parts of the body at the same time or in succession. Many of them originate from the action of a morbid poison, either entering from without, or more commonly generated within the system, or handed down by hereditary transmission. In some of these diseases no such morbific agent can be detected. *Ex.* Rheumatism, gout, cancer, tuberculosis, scurvy.

II. LOCAL DISEASES.—This group comprises the various affections to which the several organs and tissues of the body are liable. It will be convenient to describe under this heading not only primary *local* disorders, but also certain complaints which are more strictly of a *general* character, but which present special local manifestations.

I. GENERAL DISEASES.

A. IDIOPATHIC FEVERS AND ALLIED DISEASES.

Acute Specific Fevers. Acute Exanthemata.

Before proceeding to discuss the several diseases included under the above group, it will be expedient in the present connexion to consider the following subjects, viz., Fever; Contagion; and Epidemics.

Chapter I.

FEVER OR PYREXIA.

The phenomena of *fever* may be observed in connection with two distinct classes of cases:—First, they may follow and be the result of some local lesion in a tissue or organ, especially inflammation, when the fever is termed *secondary*, *symptomatic*, or merely *pyrexia*, *fever*, or the *pyrexial state*. The fever attending pneumonia will serve to illustrate this group. Secondly, they may constitute the chief and primary deviation from the normal state, not being due to any evident local cause, and if any special organ or tissue becomes morbidly affected, this occurs secondarily. *Idiopathic*, *essential*, *primary*, or *specific* are the terms applied to fever under these circumstances, or it is simply denominated *a fever*. It then originates from the presence of some morbid poison in the blood, either introduced from without, or developed within the body. The acute specifics and rheumatic fever afford examples of this class.

Essential phenomena and Symptoms. The precise symptoms which may be observed in different febrile diseases are necessarily very variable, but there are certain phenomena which are characteristic of the pyrexial condition, to whatever cause this may be due, and to these attention will now be directed. They may be arranged thus:—

1. *Rise in Temperature.*—This has been generally looked upon as the only absolutely essential sign of fever, excessive heat of the body being considered as characteristic of the febrile state. It may be evident in the aspect or sensations of the patient, or the skin may feel hot to the touch; but no reliance can be placed on these sources of information, and the existence of pyrexia must be determined by the use of the thermometer. The temperature may range from only just above the normal to 108°, 110°, or 112° Fahr., and possibly even much higher than this, but it does not often

exceed 105° or 106°. It may continue to rise for some time after death.

2. *Alterations in the Secretions.*—Pyrexia is attended with *deficient elimination of water* from the system, there being at the same time *excessive destruction of tissues.* Hence the secretions and excretions are as a rule *diminished in quantity,* as well as *altered in quality,* from which result some prominent symptoms, viz.:—*a. Dryness and roughness of the skin,* though this is not always observed, in some cases there being profuse perspiration. *b. Derangements of the alimentary canal.* The salivary, gastric, and intestinal secretions are deficient; hence the tongue is furred and the mouth clammy; there is much thirst, but no inclination for food; and the bowels are constipated. Nausea and vomiting are also not unfrequent symptoms. *c. Changes in the urine.* This is much diminished in quantity, high-coloured, very acid, with a strong odour, and of high specific gravity. It also generally contains an excess of its organic nitrogenized constituents, especially *uric acid* and *urea,* a much larger quantity of these substances being excreted during the twenty-four hours than in health. There is likewise often an increase in hippuric acid, sulphates, phosphates, and colouring matters, but not always. The alkaline chlorides are commonly deficient, and may be absent altogether. Abnormal ingredients may be present; while slight albuminuria is common in febrile cases.

3. *Derangements of the Circulatory system.*—The *pulse* is increased in frequency, and may rise to 120, 140, or more, being as a rule in proportion to the temperature. A rise of 1° Fahr. has been stated to be attended with an increase in the frequency of the pulse of eight beats per minute, but to this statement there are many exceptions. In its other characters the pulse varies greatly under different circumstances. In long-continued or severe cases it tends to become very weak, irregular, or even intermittent, these characters being associated with feeble action of the heart.

The *blood* is altered in composition, there being a diminution in the amount of alkalies present, and in the alkalinity of the serum; after a time the albumen and red corpuscles also become deficient, while the white corpuscles are often increased in number. In some forms of fever the proportion of fibrin is much above the normal; in others it is greatly reduced. In certain cases the blood is dark and fluid.

4. *Disorders of Respiration.*—The *respirations* are usually increased in frequency in febrile diseases. Some observers affirm that they are in proportion to the pulse; others that the ratio is always disturbed, the respirations being in excess. Neither of these statements will hold good for all cases. With regard to the elimination of carbonic acid, the balance of opinion is that this is above the normal on the whole, owing to the increased frequency of breathing.

5. *Disturbance of the Nervous system.*—Symptoms referable to the nervous system usually attend the pyrexial state. In the early stage chills or rigors are often experienced, with general pains or soreness, and a sense of exhaustion, languor, and inaptitude for

any occupation or effort. Some fevers present special localized pains, and headache is a very frequent complaint. Restlessness, insomnia, and slight nocturnal delirium are also common symptoms. Under certain circumstances there may be very serious nervous disturbance, indicated by great prostration; delirium, either violent or muttering; somnolence, or actual stupor tending to coma; and muscular disorders, such as tremors, subsultus tendinum, picking at the bedclothes, or convulsions.

6. *General symptoms.*—Owing to the undue waste of tissues, while at the same time but little food is taken to make up for the loss, and even this is assimilated with difficulty, febrile patients always lose flesh and weight more or less rapidly, and feel debilitated and depressed; they may become exceedingly emaciated and greatly prostrated in a short time, the tissues being very rapidly consumed. Anæmia is also frequently induced.

MODES OF TERMINATION.—Supposing recovery to take place, *defervesence* may be brought about in the following ways:—1. *By crisis.*—This mode is characterized by a sudden or rapid abatement of the fever, indicated by a marked fall in temperature, which may become normal in a few hours; at the same time there is generally a considerable increase in the various excretions, evidenced by profuse perspiration, a free flow of urine containing a large amount of solid ingredients, or watery diarrhœa. Occasionally some form of hæmorrhage occurs, such as epistaxis. 2. *By lysis.*—Here there is a gradual defervescence, the temperature subsiding slowly and regularly for some days, and there being no critical discharges. 3. *By a combination of crisis and lysis.*—At first a rapid fall of temperature occurs to a certain point, this being followed by a gradual lowering; or for some days a regular alternation of high and low temperatures is observed. 4. *Irregular.*—Occasionally defervescence is quite irregular in its progress. During convalescence the temperature and amount of excretion often fall below the normal standard.

TYPES OR VARIETIES.—The symptoms described as belonging to fever are very variously combined, and present a wide range as regards their severity and course. Hence certain types are recognized.

1. *Types depending upon the course and mode of progress of the symptoms*:—*a. Continued.*—This group comprehends all fevers which run a tolerably regular course, without any very marked variation in temperature at different periods of the day. It includes the acute specific fevers (small-pox, scarlatina, &c.); and most cases of inflammatory fever. In these complaints the temperature rises more or less rapidly up to a certain point, then remains tolerably stationary for a time, and finally defervescence occurs in one of the ways already mentioned. *b. Remittent.*—Here the fever presents marked remissions alternating with exacerbations, as indicated by the temperature and other symptoms. This variety is met with chiefly in tropical climates, but remission is also an important character of *hectic* fever. *c. Intermittent.*—This type is characterized by complete cessation of all febrile symptoms, which only come on at certain

regular intervals, and run through a definite course, the temperature in the meanwhile being quite normal. The different forms of ague afford examples. *d. Relapsing.*—In some forms of fever, after an attack of the *continued* type defervescence and apparent recovery take place, but this is followed after some days by a *relapse*, which course of events may be repeated more than once.

2. *Types depending upon the severity and combination of symptoms*;—*a. Simple.*—This form is the simplest expression of fever, presenting the characters already described, but in a mild degree. It is well exemplified in ordinary *febricula.*

b. Inflammatory.—As the term suggests, this type is usually associated with *local acute inflammations*, at all events at the outset. It does not, however, necessarily accompany every inflammatory disease, nor does the degree of pyrexia always bear a proportion to the intensity and extent of the inflammation. It is more likely to be present when some tissues are affected than others; also in young and plethoric persons, and in those of a sanguine temperament. The symptoms are well-marked, though varying much in severity, and they are of a sthenic character. Shivering or distinct rigors mark the onset, followed by considerable reaction. The temperature is high, the skin feeling hot and dry. There are marked pains in the limbs, with much headache. Vascular excitement runs high, as evidenced by a frequent, strong, and full pulse. The blood contains an excess of fibrin-forming materials, and exhibits the "buffy-coat." The digestive organs are much disturbed, there being a thickly-furred but moist tongue, disagreeable breath, great thirst, total loss of appetite, and constipation. The urine is distinctly febrile. There is much restlessness, with sleeplessness or nocturnal delirium; and occasionally severe nervous symptoms, such as convulsions or delirium, usher in the attack, especially in the case of young children.

c. Hyperpyrexial.—Here the temperature is very high, varying from 107° to 115° or more. It shows a tendency to ascend very rapidly, being associated with grave symptoms referable to the nervous system and lungs. *Hyperpyrexia* has been most frequently met with in cases of acute rheumatism and sun-stroke, but it may be observed in other febrile conditions, such as pneumonia.

d. Low types.—Under this group may be included the following:—i. *Asthenic* or *Adynamic.*—The patient is very weak and feels much prostrated. The temperature is only slightly raised, and the pulse is feeble and small, though accelerated. In short, febrile reaction is not prominent. At the same time there is not much thirst, and the tongue continues moist. Usually cerebral symptoms are not present, but there may be nocturnal delirium.—ii. *Typhoid* or *Ataxic.* "*The Typhoid State.*"—This presents some important distinctions from the former. The tongue tends to become dry and covered with a brown or black crust; the teeth and gums at the same time being encrusted with sordes. The heart's action is much impaired, as evidenced by the characters of its impulse and sounds; by the pulse, which is very weak and compressible, often irregular or intermittent; and by the tendency to capillary congestion in dependent parts, leading to low inflammation. Nervous symptoms are prominent, especially low muttering delirium, muscular tremblings and twitchings, and stupor ending in coma. iii. *Malignant.*—In some cases the symptoms are of such an exceedingly low type, being frequently attended with hæmorrhages and petechiæ, that they may be truly termed *malignant.* The terms *putrid* or *septic* are sometimes applied to fever under these circumstances. Another form of *malignant* fever is that in which some poison seems to act upon the system so violently as to cause the patient to succumb at once, there being no evident reaction, or any local lesions set up. This is sometimes observed in connection with the exanthemata.

e. Hectic.—Hectic fever is usually associated with profuse suppuration, but may attend any great drain upon the system. Phthisis frequently presents this variety in its most typical form. It is of a distinctly intermittent or remittent type, there being exacerbations, as a rule once in the twenty-four hours, occasionally twice. The fever sets in very gradually, at first only a slight evening rise in temperature being noticed, with quickening of the pulse; after a while pyrexia becomes more or less constant, but a marked increase takes place towards evening, beginning with chilliness or rigors, followed by much heat of skin, which increases up to or beyond midnight, and is succeeded by profuse sweats, so that the patient's clothes and the bed-clothes become saturated. The subjective feeling of heat is very considerable, the palms of the hands and soles of the feet having often a burning sensation. The appearance of the patient is often very characteristic and striking, there being a beautiful circumscribed bright red or pink spot on each cheek, well known as the *hectic flush.* The pulse is very easily excited and rendered quicker; during the paroxysms it may rise to 120 or more. It varies in its characters, but is generally jerky, moderately soft, and compressible. The respirations are also hurried. This fever is attended with rapid and great emaciation, while the patient feels much exhausted after each attack, becoming ultimately exceedingly feeble. The mental faculties are unaffected until near the close of life, being often, in fact, peculiarly lively and brilliant. The duration of this variety of fever is very variable, but it tends to be prolonged.

PATHOLOGY.—The pathology of the febrile state is still a matter of much doubt and uncertainty, notwithstanding the amount of experimental investigation which has been devoted to the subject. Very conflicting views are held as to its origin and nature, and as to the explanation of the phenomena by which it is characterized. It seems clear that the condition may be set up by some morbid poison which has gained an entrance into, or been generated within the system; or in connection with some local lesion, especially of an inflammatory nature. Dr. Burdon-Sanderson found in his experiments, that by injecting certain fluids—which he terms "pyrogenic"—in very small quantity into the circulation, fever could be excited, and these fluids either contained bacteria or the material out of which bacteria are developed. The view most commonly adopted, and probably the correct one, is, that at any rate the commencement of the febrile process results from some disturbance in connection with the nervous system, either directly induced by the morbid poison alluded to above, whatever this may be; or in a reflex manner, through irritation of the sensory nerves belonging to an inflamed part. It is believed that the sympathetic and pneumogastric nerves are specially implicated, which leads to increased cardiac action, and general vaso-motor disorder, with consequent paralysis of the vessels. Some pathologists do not agree with the notion of any direct implication of the nervous system in fever, but maintain that the cause which originates this condition acts immediately upon the blood and tissues. Even when pyrexia results from inflammation, they consider that the local contamination of the blood affects the whole mass, and thus gives rise to the febrile state.

There can be no doubt but that when pyrexia has been set up, it is attended with *destruction of tissues* in excess of what normally takes place. In health the structures of the body do not undergo rapid metamorphosis, the food yielding the elements by the decomposition of which animal heat is sustained; but in febrile conditions the tissues become quickly destroyed, being changed into various substances of lower chemical composition. This destruction involves the albuminous or nitrogenized tissues, as well as the fat, and hence the muscles rapidly waste, both voluntary and involuntary, their fibres presenting an appearance of granular degeneration under the microscope; the nerve-centres, ganglia, and nerves undergo a similar change; the bones become lighter; and the red blood-corpuscles are diminished in number. It is found, however, that the glandular organs do not become smaller, being, indeed, often enlarged from congestion, especially in young and healthy persons. This is particularly observed in the spleen, lymphatic glands, and liver, the cells of these organs also becoming enlarged and granular.

The substances into which the tissues are transformed are chiefly those produced in health, only formed in excess, such as urea, uric acid, and carbonic acid. Intermediate products of decomposition may, however, be generated, some of which are probably quite foreign to the body in a state of health. As to the place where the change occurs there is no certainty. Some pathologists consider that it takes place in the tissues themselves; others believe that the albuminous elements break down into a circulating albumen, which in the blood becomes converted into materials of lower grade, *e.g.*, urea.

The chemical and vital changes in the tissues and blood just described, have been usually regarded as chiefly accounting for some of the more prominent phenomena which accompany the febrile state. Beginning with the *rise in temperature*, it is well known that such destructive processes must be attended with the development of heat; while it has also been found that as a rule the temperature in febrile cases is in proportion to the rapidity and extent of these changes, especially as evidenced by the amount of the products of tissue-metamorphosis eliminated in the various excretions. In most cases *excessive excretory elimination* is observed, particularly by the urine, the quanity of urea discharged often bearing a close relation to the increase in temperature; but this is not always the case, so that the one cannot be made a measure of the other. In some instances there is little or no increased elimination during the progress of the fever. This is explained by the retention of the products of metamorphosis in the blood, owing partly to their great abundance, or to their transformation being incomplete, substances being generated which the kidneys cannot get rid of; partly to some condition of the excretory organs which interferes with the due performance of their functions. It is in such cases that *critical discharges* are most likely to occur at the termination of the fever; whilst, as the result of *deficient elimination* of the substances generated, and their consequent accumulation within the system, serious consequences are liable to ensue. Thus, the *typhoid* type of fever is usually regarded as resulting from the deleterious effects of these materials. Their circulation through the various organs and tissues, especially the nerve-centres, is supposed to originate the low symptoms observed in the typhoid condition. This poisoning of the system also accounts for the *secondary inflammations* which are so liable to arise in the course of febrile cases.

The view just considered, which attributes the phenomena of fever mainly to the excessive destruction of tissues, has of late been much questioned; and, as the result of experiments made to determine the effects upon the animal heat of making different sections of the spinal cord, as well as of observations as to what happens in cases of injury to various parts of the nerve-centres, and in certain nervous diseases, the attempt has been made to prove that the rise in temperature in pyrexia is *directly connected with the nervous system* in some way or other. There are conflicting statements respecting the effects of various sections of the spinal cord upon the heat of the body, and also as to what has been observed in cases of injury, some of which it is difficult to explain, but there can be no doubt that the temperature is often very much raseid under such circumstances. A remarkable case was brought before the Clinical Society by Mr. Teale of Scarborough, in which, in connection with some injury about the upper part of the spine, the temperature ranged for nine weeks from 108° to above 122° F., probably on one occasion reaching at least 125°, the patient ultimately recovering.

With regard to the modes in which the nervous system is supposed to influence the temperature. the main theories are as follows:—(i.) The hypothesis has been advanced that there is a *centre in the brain which regulates the production of heat*, and that when this is excluded from performing its functions, the development of heat is augmented. For such a view, however, there is no adequate foundation. (ii.) Another, and a more reasonable notion is, that the elevation of temperature is the result of *vaso-motor disturbance*. Most observers believe that the vaso-motor system is *paralyzed*, and that hence the vessels become dilated, an undue amount of heat being consequently lost from the surface of the body. Senator has, on the other hand, tried to prove that there is *increased irritability* of the vaso-motor nerves in fevers, particularly of those supplying the arteries of the skin, and that therefore the vessels contract, thus interfering with the loss of heat necessary to maintain a normal temperature.

It seems to be an established fact that the nervous system does influence the temperature of the body considerably, but, in cases which are ordinarily recognized as febrile, there is still every reason to conclude that the increased heat is to be accounted for by the exaggerated tissue-metamorphosis. Those cases of injury or disease of the nervous centres in which the temperature is raised, appear to be of a different character. As a subsidiary cause of the increased temperature in the febrile condition, it must be remembered that the *amount of perspiration* partly regulates the animal heat, and this being usually more or less checked, the temperature becomes proportionately elevated.

The views of Dr. Beale on this subject deserve notice. He believes that the bioplasm of the blood, blood-vessels, and tissues is greatly increased, and that this is the cause of the excessive heat. He further states that there is *insufficient oxidation* of tissues, as a result of which the blood becomes loaded with noxious materials which the excretory organs cannot remove, and this condition of the blood is favourable to the growth of bioplasm.

As already stated, the *low nervous symptoms* observed in certain febrile cases have been attributed mainly to non-elimination of the noxious materials resulting from destruction of tissues, and their consequent accumulation in the blood. They have, however, been also referred to the direct action of some fever-poison upon the nerve-centres; to excessive heat of the blood, though this view seems to be negatived by Mr. Teale's case; and to plugging of the minute vessels of the grey matter with white corpuscles or septic emboli.

With respect to the *circulatory system*, in the early stage the heart is excited, but as the febrile process advances this organ becomes greatly impaired in its action, because its muscular tissue undergoes degeneration; it is supplied with impure blood; and its nervous stimulus is impaired. As a consequence the alterations in the cardiac impulse and sounds, and in the characters of the pulse are observed, as well as the tendency to hypostatic congestions, these being also directly contributed to probably by the abnormal condition of the vessels, tissues, and blood, and, according to Beale, by the excessive growth of bioplasm, which tends to block up the capillaries.

Such are the main points bearing upon the pathology of *fever*. There is no adequate explanation of another phenomenon observed, viz., *the retention of water in the system.* It has been supposed that some material forms in the blood, such as gelatine, which has a strong affinity for water, but there is no proof of this hypothesis.

PROGNOSIS.—The prognosis in febrile cases must necessarily depend greatly on the cause of the fever, and will therefore vary with each particular disease. So far as the pyrexia itself is concerned, however, there are certain conditions which always influence the gravity of the prognosis, viz.:—1. *Its intensity.*—The higher the temperature the more dangerous is the case, and the prognosis becomes very serious when the temperature reaches above 107°. Under appropriate treatment, however, a considerable proportion of patients have recovered, even after the temperature has risen to a much higher point than this. It must also be remembered that in certain diseases and injuries of the nervous system, the heat may become very excessive and yet recovery take place. 2. *Its type.*—All low forms of fever are very grave, and any tendency towards typhoid or adynamic symptoms, especially if the nervous system is much affected, should be looked upon with anxiety. 3. *Defective elimination.*—This is an unfavourable sign, particularly if associated with a very high temperature. 4. *The previous condition and health of the patient.*—Young, robust, and plethoric persons are often more severely affected than those in opposite conditions. Some diseases, such as gout, increase the danger of febrile disorders considerably; while the presence of organic disease, especially of the kidneys and heart, renders them exceedingly grave.

TREATMENT.—The management of cases attended with fever is often a matter of much difficulty, and requires the most careful and constant attention. There are two rather prevalent errors which need to be guarded against. First, it must not be imagined that treatment is of no avail in febrile diseases, and that the physician has nothing whatever to do. By *judicious* interference it is possible to avert death, to relieve symptoms, and even to hasten recovery in some cases. On the other hand, *over-active* and *meddlesome* treatment is most injurious, and should be decidedly deprecated, especially in the case of those specific fevers which must of necessity pass through a definite course. The practice of endeavouring to *cut short* fevers has unquestionably often done much harm.

There are certain general indications for the treatment of the *pyrexial condition*, which will now be briefly considered, as well as the means by which they are to be carried out.

1. The first indication is *to diminish the temperature, if this tends to be excessive.*—One of the most powerful means available for this purpose is the *external application of cold.* This acts partly by increasing the elimination by the skin, but also probably by producing some marked effect upon the nervous system, and checking destruction of tissues, or, as Dr. Beale thinks, by diminishing the growth of bioplasm. The modes of applying cold are various, viz., by sponging the surface of the body with water, either tepid or cold; by cold affusion or douching, which may be practised whilst the patient is in a warm bath; by wet-packing in a sheet; by the use of cold baths; by the application of ice-bags to different parts; by injecting iced water into the rectum; or by placing the patient in a warm or tepid bath, the temperature of which is then gradually reduced by the removal of warm, and the addition of cold water or even ice, the latter being also in some cases applied to the head, spine, chest, or abdomen at the

same time. After having been kept in the bath for a varying time, according to the circumstances of the case, the patient is dried and removed to bed, and it may then be necessary to apply hot bottles to the feet. It is often requisite to repeat the bath, even for several times, and to apply ice in the intervals.

Some of the methods mentioned are not only useful in reducing temperature, but they likewise diminish the frequency of the pulse; give marked relief to low nervous symptoms; and may also have an influence upon the development of certain exanthematous eruptions, either in the way of encouraging them to come out, or of limiting their amount and improving their quality. Of late attempts have been made to establish a regular hydropathic treatment of all fevers, especially on the continent. But it seems to me, for reasons stated in a paper on the subject in the *Practitioner* for January 1875, that this has no claim to be recognized and followed as a routine method of treatment, and that there are grave objections against the more severe methods by which it is carried out. Cold or tepid sponging of the skin is the only mode applicable to ordinary cases, and this certainly ought to be practised much more frequently than is the rule at present, for it is often decidedly beneficial and affords much relief, while it is not at all dangerous if proper care be exercised. The cases, however, in which the use of external cold is so eminently serviceable, are those in which the temperature shows a tendency to ascend rapidly, or in which it has become and remains very high. My own experience corroborates that of Dr. Wilson Fox and others as to the remarkable benefit which may be derived from the employment of cold in the manner last described, when there is hyperpyrexia. Undoubtedly in similar cases not only is it advisable to follow the same mode of treatment, but this is the *only method* which seems to offer any chance of recovery. Of course it must always be conducted under the strictest supervision, and its effects carefully watched.

Venesection has been employed with the view of subduing fever, but there is positive evidence that it acts most injuriously, and therefore should never be practised merely for this object, although in the inflammatory variety it may be required.

Among medicinal agents, *aconite*, *digitalis*, *veratrum viride*, and *tartar emetic* are, in appropriate cases, most useful in fevers. They reduce the temperature in some degree, but have also a striking effect on the pulse, diminishing its frequency. Some of these drugs have a further action on the excretory organs. *Quinine* is much used for the purpose of lowering temperature, or checking its ascent. It is well known that this drug has a powerful influence upon ague, and when given in considerable doses—grs. v—xx or more,—and repeated at variable intervals according to circumstances, it appears to have some power of diminishing excessive heat. Its administration may be combined with the application of cold. *Salicylic acid* and *salicine* are in fashion at present. *Sulphurous acid*, in drachm doses every two, three, or four hours, has also been recommended. The employment of *alcohol* will be alluded to presently.

2. Another important indication is to *watch the excretions*, and

observe whether proper elimination is taking place. Some authorities advocate energetic eliminatory treatment in fever, by which they propose to get rid of any morbid poison, as well as of the products of destruction of tissues. Such treatment, however, is not advisable as a general rule, except in so far as it may be necessary to keep the bowels freely open, and to give some mild diaphoretics and diuretics; but it is requisite in severe cases to examine the excretions, especially the urine, and thus to ascertain whether the materials formed are being properly got rid of, and, if such is not the case, to adopt measures calculated to aid their removal. Should symptoms arise indicating that the system is being poisoned by the accumulation of the products of tissue change in the blood, energetic eliminatory treatment is decidedly called for. This consists in measures which promote the free action of the skin, bowels, and kidneys. Diaphoretics and diuretics are very useful, such as saline mixtures containing *citrate of potash* or *liquor ammoniæ acetatis;* along with the free use of diluent drinks. *Jaborandi* may probably be found valuable in some cases on account of its diaphoretic action. The employment of baths, as already described, also increases the skin-action. In severe cases, should the urine be deficient it is desirable to endeavour to excite the kidneys into activity by applying hot fomentations, linseed-meal poultices, or sinapisms over the loins, or by means of dry cupping. Purgatives must be employed with caution, as they are likely to weaken the patient, but they are often required, and the saline aperients are the most efficient in these cases. When diarrhœa is present, some advocate that this symptom should be permitted to continue or even be encouraged by the aid of medicines, as it is a natural mode of elimination of a poison. It certainly is not always desirable to check diarrhœa, but if it is excessive, and the patient is becoming evidently weakened, it is, in my opinion, decidedly advisable to restrain the discharge by appropriate remedies.

3. One of the most necessary and difficult parts of the treatment in many cases of fever consists in the *proper administration of diet*, including *food* and *alcoholic stimulants*. The food must be nutritious, and at the same time capable of easy assimilation. Milk is a most valuable article of diet, as well as good beef-tea, chicken-broth, and eggs. A most important matter which it is often necessary to attend to is to give the food at *frequent and regular intervals*, in *definite* and *moderate quantities*, and a patient should not be allowed to sleep for too long a time, and thus be deprived of the requisite nutriment. It is quite impossible to lay down any definite rules, as each case must be treated on its own merits. In the low forms of fever large quantities of nutriment are called for.

With regard to *alcoholic stimulants*, these are by no means always required, and their indiscriminate use may do a great deal of harm, but in a large number of cases they are very valuable, though much experience is necessary in order to determine the particular kind and quantity of stimulant to be administered under different circumstances. Therefore young practitioners should be particularly cautious as to how they employ these remedies, and should watch their effects very closely. Wine or brandy generally answers best, of which it may be necessary to give very large quantities, and it is astonishing how much may be taken in certain cases without producing the ordinary intoxicating effects of alcohol. It is most important that stimulants should be administered at *regular intervals* and in *definite doses*. The essential value of alcohol consists, not in its making up for food, which must be given at the same time, but in that it maintains the action of the heart while the system is struggling against the fever. Hence the chief indication for its use is to be found in the condition of this organ, as evidenced by its impulse and sounds; by the state of the pulse, as regards its frequency, force, and amount of tone; and by the condition of the capillary circulation. Other organs, however, must not be overlooked, and in judging of the effects of the administration of stimulants, attention must likewise be paid to the tongue, skin, respiratory organs, and nervous system. Their good effects are seen in that the tongue becomes moist and less furred, while the skin perspires, the temperature falls, the number of respirations diminishes, and the nervous system is calmed. If the tongue becomes dry and baked, the skin burning and non-perspiring, the respirations hurried, and the nervous system excited, alcohol is doing harm. With regard to its influence on temperature, this agent has been proved only to lower this directly when given in large quantities, and then only to a comparatively slight degree. My own experience has convinced me that in hyperpyrexial cases it is requisite to be exceedingly careful in the administration of alcoholic stimulants, and that they ought not to be poured into the system in a reckless manner, with a view of lowering the temperature.

It is in the later stages of fever that alcohol is most useful, and especially when it tends towards an asthenic or adynamic type. No case, however, should be allowed to sink into a low condition for want of stimulants, as it may then be very difficult or impossible to revive the patient. If there is any probability of this event taking place, they should be employed from the first. At the same time it is very important in these cases to watch constantly and thoroughly, and to observe at frequent intervals the effects of the administration of stimulants, lest they should be pushed too far. This may be judged of partly by the smell of the breath. They must be given with particular caution if the urine is very deficient or contains albumen. As to the quantity required, this will vary much in different cases. Usually from a tea-spoonful to a table-spoonful of brandy will be needed at intervals of from three hours to half an hour, according to circumstances. Old people require a large quantity as a rule, and young children bear stimulants well. Wine or brandy may be conveniently given beaten up with eggs, the *Mistura: spiritus: vini: gallici* being an excellent preparation; or along with beef-tea.

Dr. Beale has arrived at the following conclusions respecting the good effects of alcohol in cases of fever and inflammation:—1. By its *direct* action on the nerves of the stomach it immediately stimulates the heart's action, and thus promotes the capillary circulation.

2. After absorption into the blood it alters the consistence and chemical properties of fluids and solids, and cuts short the life of rapidly growing bioplasm, or causes it to live more slowly. It reduces the permeating tendency of blood-serum; renders the walls of the vessels less permeable to fluids; checks the disintegration of blood-corpuscles; interferes with or modifies chemical changes; and has a direct action upon the particles of naked and living bioplasm.

4. Attention to *hygienic conditions* is another point of much importance in connection with febrile diseases. This matter will be again specially considered, but in the meantime it may be stated that two of the most essential requisites are *free ventilation*, so as to ensure that the patient obtains plenty of fresh air, and to remove that which is vitiated; and *cleanliness*. *Rest of the body* and *mental quietude* are also most important elements in the treatment of many febrile cases. Patients should not be disturbed by the presence of friends or others who are not required in the sick-room. Of course *competent nursing* ought to be specially provided, and the nurse should wear dresses which do not rustle, and to which, in the case of contagious fevers, the contagious poison will not readily adhere.

5. Many *symptoms* arise in the course of febrile diseases which require special treatment, and, in order to avoid repetition, it may be useful to consider the more common of these in some detail.

Symptoms referable to the digestive organs are often troublesome. *Thirst* is almost always complained of more or less. For its relief the following drinks will be found agreeable in different cases viz., simple iced-water; barley-water; toast and water; iced milk with soda-water; solution of chlorate of potash (ʒj to Oj), which may be flavoured according to taste; some acid drink, such as lemonade made with the juice of lemons, or a drink composed of ʒj of dilute hydrochloric acid, with Oj of water or barleywater, and a little honey or sugar; tamarind water; or iced champagne and seltzer-water in small quantities, if stimulants are indicated. The frequent sucking of small fragments of ice will generally be found of much service. Patients may also in most cases be allowed to suck juicy fruits in moderation, such as grapes or oranges. It is often necessary to give instructions to the nurse to cleanse the mouth from time to time.

Vomiting is not uncommonly a symptom needing attention. Many practitioners adopt the plan of giving an emetic at the commencement of any febrile attack, but the advantages of this routine method of treatment are by no means obvious. If, however, vomiting or an inclination to vomit seems to be due to some irritant in the stomach, an emetic is useful, such as a full dose of *vinum ipecac.* or *sulphate of zinc*, followed by plenty of luke-warm water. In order to check vomiting special attention must be paid to the diet, and it will be well to give no food at all if this symptom is troublesome, except very small quantities of iced milk with lime-water or soda-water at frequent intervals; or a tea-spoonful of brandy with the same quantity of strong beef-tea or beef-juice. Iced champagne with seltzer water in small doses is also very serviceable, as well as the sucking of ice. With regard to medicinal remedies, the most efficacious in febrile conditions are *effervescent draughts* with *hydrocyanic acid*—♏ iii.-iv.;—or the latter with a little *mucilage* or *bismuth*. If *opium* or *morphia* is admissible, it is useful in some cases to add tincture of opium or solution of morphia—♏ iii.-v.— to each effervescent draught. When sickness resists the ordinary remedies, minute doses of *strychnia* sometimes have a remarkable effect in checking it. *Local applications* over the epigastrium are also serviceable in obstinate cases, viz., linseed-meal poultices, sinapisms, flying blisters, or cold by means of the ice-bag. Care must be taken that the tendency to vomiting is not kept up by anything wrong in the sick room, such as bad smells or deficient ventilation.

The *bowels* very often require to be regulated. In most cases *constipation* is the symptom calling for treatment. For this the best remedies are usually the ordinary *black draught; sulphate* and *carbonate of magnesia* with *peppermint-water; Seidlitz powders; castor-oil*; or, for children, *rhubarb* and *magnesia*. In some cases more powerful purgatives are required. *Diarrhœa* sometimes needs to be checked, but it must be borne in mind that this may be a mode of elimination, and therefore it should not be heedlessly interfered with. It may be generally stopped, if necessary, by the ordinary remedies in different combinations, such as *opium* in the form of pill, tincture, or enema; *carbonate of bismuth; chalk-mixture; tincture of catechu; mineral acids;* or *Dover's* or *compound kino powder*.

Head-symptoms are among the most common needing attention in acute febrile diseases. If *headache* is severe or persistent, it is desirable to apply some cold lotion or an ice-bag to the head or nape of the neck, or to employ cold or warm affusion, the latter answering best for old and feeble patients. It is often advisable to cut the hair very short, or even to shave the scalp. Dry-cupping over the nape of the neck is also serviceable in some cases, or, if the patient is young and robust, it may be useful to apply two or three leeches over the temples. Similar treatment is indicated should there be active or violent *delirium*, this symptom being often much relieved by freely douching the head with water, either cold or warm. Small blisters to the temples or nape of the neck are also beneficial in some cases. Low delirium generally calls for stimulants.

Sleeplessness is a very important symptom to treat, and demands great attention. Patients often suffer seriously from want of sleep, and I believe very injurious consequences sometimes result in fevers from a needless dread of giving narcotics. *Opium* and *morphia* are the chief remedies of this class, and it is best to give either of them in the liquid form in a tolerably full dose. If there is much throbbing head-ache or active delirium, it is recommended to combine the opium with a small dose of tartar emetic or with ipecacuanha, Dover's powder forming an excellent compound in which the latter is contained, and one which I have frequently found act very beneficially. Should there be a tendency to low delirium, opium may be given along with stimulants. This drug is contra-indicated if the lungs are involved to any extent, and the respiratory functions are much interfered with; if the kidneys are affected; if there is any tendency to stupor; or if the pupils are much contracted. Other useful medicines for procuring sleep, which some practitioners employ in preference, are hydrate of chloral (gr. xv.—xx. or more); bromide of potassium (gr. xv.—xxx.); tincture of hyoscyamus (m L.—LXXX.); tincture of belladonna; chloroform; and nepenthe. General *restlessness* and *irritability* is frequently much relieved by sponging the skin, or in some cases it may be desirable to put the patient into a warm bath. If the sense of hearing is unpleasantly acute, it is useful to put a little cotton wool into the ears. Any tendency to *stupor* or *coma* must be combatted by douching the head freely; blistering the nape of the neck; applying sinapisms or turpentine fomentations to the legs and chest; and administering diffusible stimulants internally, with strong coffee. In extreme cases much benefit has followed the application of a blister to the shaven scalp. It must be remembered that any of the nervous symptoms above alluded to may be dependent upon retention of deleterious materials within the system, and therefore care must be taken that the excretory organs are acting properly, while it may be requisite to promote the removal of the retained morbid products, by exciting a free action of these organs.

Measures directed against *adynamic* or *typhoid* symptoms are very often called for in the course of febrile diseases. As already stated, alcoholic stimulants and abundant nourishing food are demanded under such circumstances, and it is extremely important that these should be administered at frequent intervals, strict directions being given that the patient should not be allowed to sleep for too long a time, and thus be deprived of the necessary support. In addition to these remedies, certain tonic and stimulant medicines are very useful in adynamic cases, viz., *ammonia* with *decoction of bark*, *quinine* in full doses, *mineral acids*, *sulphuric* or *chloric ether*, *chloroform*, *camphor* and *musk*. At the same time sinapisms may be applied over different parts. When there is great depression, strong coffee and phosphorus have been found serviceable. If patients are in such a condition that they cannot swallow, recourse must be had to enemata, by means of which food and stimulants, as well as medicines, may be administered. It is important in these cases to look to the bladder, and to take care that it is properly emptied, the catheter being employed if required.

6. In acute fevers it is requisite to watch for, and take every precaution against *local complications*, and to treat them as they arise. It is especially needful to look to the state of the lungs, as these organs are very liable to become the seat of hypostatic congestion or inflammation. Position will have some influence in preventing this untoward event, the patient not being allowed to lie with the head too low, while change of posture from time to time is encouraged. It is further advisable to promote cough and expectoration occasionally, so as to avoid any accumulation of mucus

in the bronchial tubes. Inflammations arising in the course of fevers do not contra-indicate the use of stimulants, provided these remedies are otherwise called for. Indeed, not uncommonly they indicate a necessity for increasing their amount. Particular attention should be directed to the prevention of bed-sores, as they are very prone to occur. The parts upon which the patient lies must be frequently examined, and kept dry and clean; should there be the least sign of irritation, a water-pillow or bed ought to be employed, and the skin washed over with some spirit and water.

7. Great care is usually required during *convalescence* from fevers, as regards diet, hygiene, and medicinal treatment. Tonics and remedies for promoting digestion are often very beneficial. Undue muscular exertion and fatigue must be avoided for some time. Change of air is often attended with marked benefit, and hastens convalescence considerably.

CHAPTER II.

ON CONTAGION AND EPIDEMICS.

1. CONTAGION.

THIS is the most convenient place for entering upon a brief discussion of the main facts and theories associated with this most important subject, because, though it has to do with some other maladies, its chief interest is connected with the acute specific fevers. Using the word in its general sense, a *contagious disease* may be defined as "a disease which is capable of being transmitted from one animal to another, either of the same or some other species." The agent by which it is so transmitted is named *the contagium* or *contagion.*

1. *Origin and source of contagion; conditions under which it exists; and modes of propagation.*—It is needless to enter into any discussion as to the primary origin of the various contagious poisons, and as to whether they are capable of being developed *de novo* at the present time. Probably a few of the contagious diseases may be thus generated, but the majority of these affections which have to be dealt with are communicated from one human being to another, while a small number are transmitted from some other animal to man *e.g.*, vaccinia, hydrophobia, glanders, and malignant pustule. In some cases the latter can be re-transmitted to the same or another animal, usually in a modified form. It has been suggested that possibly the contagious poison may occasionally be derived from plants.

The *contagium* exists under different forms, and is given off in different ways. There is one distinct class of affections in which it is associated with obvious parasitic animals or plants, or their germs, *e.g.*, scabies and the various forms of tinea. In other cases the contagium is believed to be connected with organized cells, such as those of cancer. Not unfrequently the poison is conveyed by means of pus or other materials, derived from an inflamed or ulcerated surface, or from pustules, of which gonorrhœa, syphilis, small-pox, glanders, and puerperal peritonitis afford illustrations. It may exist also in the contents of papules or vesicles; or in the substance of the dried scab which succeeds a pustule, as in the case of small-pox. Many contagious poisons have no palpable form, but are given off in the various exhalations and excretions of the body, especially in those emanating from the lungs and skin. Some are supposed only to contaminate the breath, such as that of hooping-cough; others seem to be present in all the exhalations, as well as in the various secretions, *e.g.*, that of small-pox. The poison of scarlatina is very abundant in connection with the epithelium of the skin which is shed in this disease. Cholera and typhoid fever are commonly believed to be communicated only through the fæces, which can impart specific characters to any excrement with which they are mixed. Hydrophobia is an example of a contagious malady only transmissible through a special secretion, viz., the saliva. It has been said that malignant pustule may arise from eating the flesh of an animal affected with this disease. The blood may be the channel by which a contagious poison is directly conveyed. It is important to remember also that the emanations from the body of a person who has died of an infectious disease may give rise to the same malady in another individual, and this may continue for some time after death.

The next point to consider is, how the contagium may be transmitted from one animal or individual to another, and how it gains access into the system? In some cases it is necessary to bring the material in which the poison resides into close and intimate relationship with the minute vessels of the tissues, so that immediate absorption may take place. This is artificially carried out by *inoculation*, *i.e.*, by puncturing the skin or otherwise destroying its superficial portion, and introducing the material into the subcutaneous areolar tissue. It may be absorbed, however, through any abrasion or ulcer, either on the skin or a mucous surface. Hydrophobia, syphilis, and vaccinia are examples of diseases which can only be propagated in this way.

Another mode of communication is by *direct contact*, without any breach of continuity of the surface. This has been specially termed transmission by *contagion*, but it is not advisable thus to limit the use of this word. It is particularly through mucous membranes that contagious poisons enter the system in this way, as is well illustrated by gonorrhœa and purulent ophthalmia. Parasitic diseases are propagated by contact *e.g.*, scabies; and it is stated that malignant pustule may arise in consequence of the purulent matter soaking through the skin.

Many contagious affections can be conveyed from one individual to another without the necessity of any immediate contact between them. The contagium is given off into the surrounding atmosphere, and thus passes to the unaffected person, being subsequently inhaled or swallowed, or absorbed by the skin. To this mode of communication many would limit the application of the word *infec-*

tion. The poison may also become mingled with the food, such as milk, and be thus taken into the system. Further, the contagious elements often become attached to what are termed *fomites*, viz., articles of clothing, especially those of a woollen, silken, or cotton fabric; bedding and bed-clothes; hair, and various other articles, and they are thus propagated. They may retain their activity under these circumstances for long periods, in this way being the means of originating their several diseases after considerable intervals, though they tend to become weakened by lapse of time. Persons passing between the sick and healthy often carry a contagious disease to the latter. A contagious poison may also be conveyed by clothes sent to be washed, or sent home from an infected school; as well as by letters, cabs, and numerous other agencies. Moreover it frequently becomes attached to furniture, or to the floor and walls of rooms, and thus infection may arise after an indefinite interval, if the apartments have not been properly disinfected.

Flies and other insects are believed to be the means of disseminating contagious diseases in some instances, by alighting first on diseased, and then on healthy individuals. Water taken into the stomach is a most dangerous medium for conveying the poison of cholera and typhoid fever, in consequence of the excreta of patients suffering from these complaints finding their way into, and becoming mixed with this medium.

Some contagious maladies may be communicated by all the modes just considered, others only through one of them, as will be pointed out when treating of these affections individually. The opinion has been expressed that they are all inoculable if the necessary conditions could be ascertained, but there is no proof of this statement.

After it has reached an individual a contagious poison attaches itself to the skin, as well as to the mucous membrane of the mouth, nose, throat, respiratory passages, alimentary canal, and other parts, and it may even find its way into the air-cells of the lungs. It then passes through the more delicate membranes, or becomes embedded in the thick mucous tissue, through which it gradually finds its way, or penetrates the little chinks between the epithelium cells of the skin. Thus it reaches the minute capillaries and lymphatics, into which it enters and is subsequently carried through the system. Absorption is promoted by a swollen, soft, and moist state of the skin; or by a weak, distended condition of the capillaries; it is especially facilitated by the presence of wounds or abrasions, and by such a condition as that of the interior of the uterus after delivery (Beale).

2. *Degrees of contagiousness of different diseases, and modifying influences.*—There are marked differences with regard to the facility and certainty of the transmission of contagious diseases. Some, such as small-pox, are very readily communicated; others, such as typhoid fever, are uncertain. Many modifying influences are also at work. The probability of a contagious disease being communicated is as a rule in proportion to the quantity and strength of the

poison which reaches the system, but it must be remembered that in many instances a very minute quantity is sufficient. The virulence of the contagium also varies often at different periods in the course of an infectious malady or of an epidemic. The *mode of application* has considerable influence, inoculation being obviously the most certain. It is believed that a contagium becomes weakened by passing through several individuals. If any fluid containing a contagious poison is much diluted, there is less chance of successful inoculation. From experiments made with the lymph of small-pox and other infectious liquids, it would appear that by allowing such liquids which contain contagious particles to stand for some time, the latter subside to the bottom, so that the upper layer of fluid may be inoculated without producing any effect. By thorough filtration also the particles may be separated. This proves that the liquid portion does not contain the contagium, but that the latter resides in the separated particles.

Much will depend frequently on the temperament, constitution, state of health, and previous habits of the individual to whom the contagium is applied, as to whether the disease will be transmitted or not. A previous attack of a contagious malady usually protects against a second, but not invariably, though when a second attack occurs, it is generally of a mild character. Syphilis cannot be produced even by inoculation after this has been done a certain number of times. It is unusual, but not impossible, for two infectious diseases to be present in the same person at the same time, and, if such an event occurs, they generally modify one another; in some instances one affection of this kind exercises a protective influence against another, either temporarily or permanently, or greatly modifies it, as is well exemplified in the relation between small-pox and cow-pox. Some individuals seem quite insusceptible to certain infectious disorders, without any apparent reason for this. In such cases it has been suggested that the disease has occurred during intra-uterine life.

External conditions have a very important influence in the dissemination of contagion. Unfavourable hygienic circumstances undoubtedly increase the virulence of contagious poisons. It is affirmed that water intensifies the virulence of the contagium of typhoid fever and cholera. Climate and season have a considerable modifying effect, some diseases requiring a high temperature for their development, others being checked by much external heat. The direct application of great heat or extreme cold, as well as of certain chemical agents, is of the highest importance in destroying contagious poisons and rendering them inert, as upon this effect depends in a great measure the power which is possessed of checking the spread of the diseases originated by these agents. Among the most efficient chemical substances acting thus are chlorine, iodine, hypochlorite of lime, chloride of zinc, sulphurous acid and sulphites, creosote, carbolic and cresylic acids, Condy's fluid, and chloralum.

3. *Nature of Contagion.*—There are certain contagious affections which are evidently dependent upon definite parasitic plants or

animals, and, in each individual disease of this class, the particular animal or plant which originates it obviously constitutes its contagious element. With regard to the ordinary infectious diseases, it is assumed that in connection with each of them there is a "specific morbific agent or poison, capable of exciting and propagating this one disease and no other, and without the action of which upon the the system it cannot possibly arise." This supposed poison has been variously named a *contagium*, *virus*, *zyme*, or *ferment*. The nature and mode of action of contagia are questions which are warmly disputed at the present time, and towards the elucidation of which important and interesting researches have been, and are still being carried on. The discussion held at the Pathological Society on the "Germ-theory of disease," which was introduced by a very able paper by Dr. Charlton Bastian, served to bring out the principal views entertained on this subject, and an endeavour has been made to incorporate these views in the following remarks.

Some contagious diseases, and especially infective forms of inflammation, are associated with distinct morbid products, such as pus. It is commonly believed that in these affections the contagium is something distinct from such morbid materials, and that these only form a vehicle for its transmission, but several high authorities maintain, and this was the view advocated by Mr. Hutchison in the discussion, that in the contagious inflammations the inflammatory products themselves constitute the *contagion.*

Putting out of the question the idea which some hold, that a contagium is a something—a subtle entity—which it will ever be impossible to separate or to distinguish, the theories which are at all worthy of consideration, and between which the main argument at present lies, may be classed as:—1. Chemical or physico-chemical. 2. Vital or Germ-theories. Under the former, two chief views deserve to be mentioned, viz:—*(a.)* That the contagium in each case is a specific chemical compound, probably of an organic nature, and either solid, liquid, or in the form of a volatile gas; or *(b.)* That it is albuminoid matter in a state of rapid chemical and physical change—in short, mere decomposing organic matter. The *germ-theory* has been received with much favour, but many eminent investigators strenuously oppose it, and amongst these Dr. Bastian stands prominently forward, while others are very dubious, and will not give any definite opinion on the subject. According to this hypothesis, it is affirmed that all contagious diseases arise from the action of *living germs*, which are specifically distinct from each other in the several individual affections. There is by-no-means an agreement in the opinions held as to the character of these supposed germs, or as to the precise mode in which they exercise their injurious influence. Those who adopt the germ-theory generally believe that they are *living microscopic parasites or their germs*, which may either belong to the vegetable kingdom, such as minute fungi; or to the animal kingdom, including living objects variously described as bacteria, vibrios, micrococci, microzymes, zoogloea, &c. With respect to the part which these organisms play in the propagation and development of contagious maladies, it is usually supposed that they themselves constitute *the contagium*, and that "their powers of producing disease are due to their organic development." Dr. Burdon Sanderson has suggested "that they may serve as carriers of infection from diseased to healthy parts, or from diseased to healthy individuals, and yet be utterly devoid of any power of themselves originating the contagium they convey." Prof. Lister has advanced the view "that the lower fungi and their relations bacteria, may contain in themselves some chemical compound absolutely peculiar to them, and forming part of their substance, which may act upon albuminous compounds after the manner of a ferment."

Dr. Beale entertains a very distinct germ-theory from that just considered. He maintains that the germs are not parasites, but that they are extremely minute particles of *living germinal matter* or *bioplasm*, which present no differences in appearance in different diseases, even under the highest powers of the microscope, but have an essential difference in vital power. He says "a disease-germ is probably a particle of living matter, derived by direct descent from the living matter of man's organism." Dr. Maclagan, in the discussion at the Pathological Society, while advocating the germ-theory, gave it as his opinion that "the organisms which produce the phenomena of disease are not those which we see and describe as bacteria, but other and much more minute organisms. He added "I think, indeed, it is still an open question whether true disease-germs have ever been seen. Of their existence we judge by the phenomena to which they give rise."

The arguments upon which the commonly-accepted germ-doctrine mainly rests are, that this doctrine explains more satisfactorily than any other the phenomena which contagious diseases present, the multiplication of contagium within the body, as well as its power of retaining its vitality for long periods and resisting destructive influences; and on the fact that tissues which are the seat of infective inflammations are filled with bacteria, while definite and specific living organisms have been described in connection with certain contagious disorders, and also fungoid growths associated with cholera, but recent researches by Dr. Creighton throw great doubt upon the accuracy of these observations, while Drs. Lewis and Cunningham have failed to discover any organisms in cholera, after the most careful and searching investigations. The bacteria present in inflamed tissues are, moreover, considered by Bastian and those who agree with him, not as the cause of the morbid process, but as pathological products, being developed from pre-existing germs, the tissues undergoing a bacterial degeneration.

4. Effects of the action of a contagium upon the system, and the changes it undergoes.—The effects of contagium may be entirely local and superficial, as in the case of scabies, and probably gonorrhœa; or, in a few instances they are at first local, but subsequently become general or constitututional, *e.g.*, syphilis. As a rule, however, the primary action of the morbific principle is on the general system, and this is usually followed by local lesions. At present attention will only be directed to the course of events last-mentioned, as connected more particularly with the specific fevers.

When the poison of a *specific fever* enters the system, it is generally believed to produce some primary change in the blood, but some think that it acts first on the nervous system. The blood becomes soon altered in its physical and chemical characters, its fibrin being especially diminished. It is a favourite notion that a fermentative or *zymotic* process is set up, and that there is an analogy between ordinary fermentation and the mode of action of contagia. This supposed analogy, and the belief that fermentation is invariably associated with the growth of low organisms, which, however, more recent researches seem to contradict, laid the foundation for the germ-theory as applied to contagious disorders. Bastian rejects the idea of any such analogy, and maintains that a contagium has merely a chemical or physical action upon the blood and tissues.

After a contagium enters the sysem it undergoes rapid increase, and those who adopt the germ-theory assume that it is capable of self-multiplication, the germs multiplying probably at the expense of the albuminous elements of the blood, walls of the vessels, and tissues, so that the minutest quantity of a contagious poison introduced into the body may generate an enormous amount of the same. There is no adequate proof of this, however, and all that can be said with certainty is, in the words of Dr. Murchison, that the " poison is multiplied." At first there is no evident sign of the action of the contagium upon the system, but a *period of incubation* ensues, differing in duration in different diseases, though having tolerably defined limits in each several malady. This incubation-period is generally considered as lasting from the time of entrance of the contagium into the system, until the first onset of definite symptoms, there being in the meantime either no symptoms at all, or none of any distinct character. It may be very prolonged, as in the case of hydrophobia, which may remain dormant for many months certainly. In the case of the *eruptive fevers*, however, Dr. W. Squire and others reckon this incubation-period as terminating with the appearance of the eruption, but it will be more convenient in this work to follow the definition given above. The action of the contagious poison, when it originates *a fever*, is first indicated by more or less severe *general symptoms* of a *pyrexial* character, the onset of which is usually well-marked, and characterized by rigors and other symptoms. Frequently there are local symptoms in addition. The contagium may act so violently upon the system, and its increase may be so rapid, as to cause death at the very outset, and without the production of any evident structural lesion. If this event does not happen, the local manifestations of the disease become developed after a certan time, which may be limited to one tissue or organ, or be observed in several parts, and these constitute its *anatomical characters*. The various eruptions characteristic of many of the contagious fevers, constitute important local manifestations of these affections. The lesions are indicated by local symptoms, but they often aggravate the constitutional disturbance as well. After a certain period has elapsed the symptoms subside, and if there has been fever, *defervescence* follows according to one of the methods already described. The poison ceases to increase, and is finally expelled altogether out of the system. Permanent structural changes may or may not remain.

It is important to observe that in each of these specific diseases there is a considerable regularity and uniformity, not only in the *course* of the stages above described, but also in their *duration*, and therefore in that of the entire affection from first to last, and it is necessary to become acquainted with this *natural history* of the several maladies. *Complications* and *sequelæ* are, however, very liable to arise, which interfere with the natural progress of events. Great variety is also observed as regards the intensity of these diseases. In some instances they are very mild; in others they assume a typhoid or malignant type, and are extremely fatal. This difference is sometimes seen running through epidemics.

5. *Elimination of contagious poisons.*—As has been already stated, in many instances the contagium ceases to multiply after a time, and it passes out of the system, this also occurring during the entire course of the malady. The main theories as to the modes in which this removal is effected are:—*a.* That the living particles make their own way out of the vessels and through the tissues, and thus reach the surface. *b.* That they are conveyed outwards suspended in the fluid which transudes from the small vessels. *c.* That the poison is directly eliminated by the agency of epithelial and secreting cells, especially those of the skin, kidneys, and intestines. According to this idea the cells attract and separate the contagium, and are then cast off, being replaced by new ones. Those who believe in this theory look upon the eruptions, epithelial desquamation, diarrhœa, and such phenomena as *efforts of nature to eliminate the poison*, and on this they found a special treatment, by which they propose to assist nature in this eliminatory process. There are strong objections, however, to this view. Beale argues not only that the cells have no eliminatory power, but that the poison actually destroys them, and that this is the cause of the profuse shedding of epithelium which is observed at the close of some of the contagious diseases, such as scarlet fever.

II. On Epidemics.

Diseases are divided into three classes, according to the manner in which they are disseminated among the population, viz.:—1. *Sporadic*, or those which occur in an isolated and scattered manner, and do not attack large numbers of people at the same time, *e.g.*, bronchitis. 2. *Endemic*, or those which are peculiar to certain districts, or which are constantly prevalent in these districts to a greater or less extent, *e.g.*, ague. 3. *Epidemic*, or those which suddenly attack large numbers of people, and spread rapidly amongst them, often causing great devastation, this event occurring at irregular intervals, *e.g.*, cholera. These three classes, however, are not absolutely distinct. Sporadic cases of epidemic diseases are common enough, and these are frequently endemic in a district;

for instance, typhus fever often prevails in the filthy quarters of large towns. The term *zymotic* and *miasmatic* are in common use to designate certain diseases. *Miasmatic* is a term applied to all *specific fevers*, but it has also been limited to those of *malarial* origin. The word *zymotic* does not imply any fermentation-theory of disease, but is now made to include all epidemic, endemic, and contagious maladies which are capable of being prevented by attention to hygienic and other conditions.

Attention will now be directed to the subject of *epidemics*. They are supposed to be originated by some *epidemic influence*, the nature of which is in most cases quite unknown. An epidemic may sometimes be distinctly traced to the influence of contagion, aided by unfavourable hygienic conditions, or to some other obvious cause, such as famine, but in most instances its origin cannot be thus definitely fixed. Certain diseases prevail as epidemics which probably are not infectious, *e.g.*, influenza. Various theories have been suggested to explain the occurrence of epidemics under these circumstances. The *epidemic influence* or *constitution* has been supposed to reside in the atmosphere around us, and to depend upon the influence of the heavenly bodies; upon gases emitted in connection with volcanoes and earthquakes; upon the electrical condition of the air; upon the quantity of ozone in it; or upon the rapid development and migration of microscopic animalcules. All these, however, are mere hypotheses. When an epidemic of a contagious disease arises as the result of evident anti-hygienic conditions, or from some other obvious cause, it is believed either that the *specific poison* is increased in quantity or rendered more virulent; or that the constitution of individuals becomes so altered as to render them more amenable to its influence, and less able to resist it.

The chief facts observed in connection with epidemics may be stated under the following laws:—1. Epidemic influence chiefly affects those diseases which are infectious, rendering them more prevalent and more dangerous; or malarial diseases, *i.e*, those due to a poison originating in the decomposition of vegetable matter. As a rule only one of these complaints is epidemic at the same time, but sometimes there seems to be a tendency to the prevalence of several of the acute specific diseases together. Occasionally other maladies appear to assume an epidemic character; and now and then an entirely new disease makes its appearance in this way. Sometimes it is only the *type* of the ordinary diseases which is influenced; or there is a tendency to the implication of special organs. 2. The prevalent epidemic affects more or less the characters of other diseases. This is well illustrated in the case of cholera and influenza, choleraic diarrhœa being very common during the existence of the former, catarrhal affections during the prevalence of the latter. 3. The *extent* of an epidemic varies much. If this is very large, the disease usually attacks different places in succession, becoming milder in one region as it invades another. It may be confined to a certain district, being then usually due to some evident local cause. 4. The *progress* is also subject to variations. Generally it is regularly onward in a definite direction, and in this way an epidemic may make the circuit of the globe. It may advance very rapidly, or exceedingly slowly and gradually. Sometimes an epidemic seems to leave a place and then return, as if falling back upon itself; or it passes over special regions without affecting them; or it goes out of its course in a lateral direction, attacking parts not in the line of progress. Epidemics are not under the influence of winds, as they frequently advance in a course directly contrary to these. 5. The *mode of invasion* may be sudden, or more or less gradual; usually the latter. An epidemic disease also generally gives indications of its approach by the occurrence of cases presenting some of its symptoms in a mild form; thus, cholera is generally preceded by cases of diarrhœa, or a few sporadic cases may occur, giving warning of its approach. 6. The *intensity* of an epidemic is subject to much variety, the disease being in some instances exceedingly fatal, in others comparatively mild. It is most virulent as a rule at the early period, judged by its characters and fatality. This is partly explained by the fact that probably those are first attacked who are most predisposed. 7. The *mode of disappearance* is generally gradual also, cases becoming by degrees less severe and fewer in number; but it may be rapid, either from some evident cause or not. 8. The *duration* of an epidemic is very irregular. It may persist, with intermissions, for several years, *e.g.*, cholera. 9. *Cycles of epidemics* are frequently observed, one disease being after a certain time followed by another, and this by a third, and so on. The theory has been advanced to explain epidemics, that there is what is termed a *pandemic wave*, under the influence of which a series of *oscillations of febrile diseases* occur, these following each other regularly over the globe. 10. It is most important to notice that epidemics are greatly *under human control*, and that they can be prevented or made much less severe by attention to proper hygienic and other measures, which will be presently considered. With the advance of civilization some epidemic, as well as endemic diseases, have been entirely eradicated from countries and districts where formerly they were exceedingly rife; and, by well-directed efforts, there is no reason why many others should not be completely expelled. 11. Epidemic influences seem to affect other animals at the same time as human beings, and it is not at all improbable that the same is true with regard to plants.

III. On the Hygienic Treatment of Contagious Fevers; and the Prevention and Limitation of Epidemics.

A most important object to be kept in view, when treating a patient suffering from an infectious fever, is to prevent its extension to others, and the means which promote this end are also most useful as regards the well-being of the patient. The measures to be attended to will now be briefly considered.

1. *Separation* is necessary from other individuals as far as possible, and in many cases almost complete *isolation*. At all events

anything like over-crowding must be avoided, and only those persons who have any business in the sick-room should be admitted. They should wear clothes to which the contagium cannot easily adhere, and go as little as possible into the midst of healthy people. Medical men ought to take adequate precautions against conveying any contagious affection. 2. Proper *ventilation* is essential, and this is best carried out by placing the patient in a large room, and opening the windows more or less according to the weather, by night as well as by day, care being taken of course to protect the patient against draughts. A good fire in the room materially assists ventilation. 3. All excessive curtains, bedclothes, carpets, and other things which may act as *fomites*, ought to be removed. In this way also ventilation is promoted. 4. *Cleanliness* must be thoroughly attended to, as regards the patient, bed, clothing, bed-room, &c. 5. Those who come into contact with the patient should avoid inhaling the breath or exhalations, and should afterwards not swallow the saliva, but clean out the mouth and nostrils. 6. One of the most important matters to attend to is the *disinfection* or *complete destruction* of everything which might convey the contagion. In the first place all *exhalations* and *discharges* should be *at once disinfected*. Anything coming off from the skin is best destroyed by frequent sponging with some disinfectant, such as a weak solution of Condy's fluid or carbolic acid. The air of the room should also be somewhat impregnated with some volatile material of this nature, such as chlorine (from chloride of lime), carbolic acid, or sulphurous acid. It is further recommended to place across the doorway a sheet moistened with dilute carbolic acid, Burnett's fluid, Condy's fluid, or chloralum. Secretions from the nose or mouth ought to be removed by means of disinfected rags, these being immediately burnt. Excretions *should be received into utensils* containing some disinfectant, and thoroughly mixed with this before being removed from the room. This is especially needful in the case of those diseases which are known to be propagated chiefly by the stools, viz., cholera and typhoid, and if possible a separate water-closet should be used for the reception of the excreta in these affections, which should be frequently flooded with some disinfecting fluid. The best disinfectants for this purpose are carbolic acid and carbolic powder, chloride or sulphate of zinc, chloride of lime, or chloralum. All dirty clothing, bed-clothes, &c., must be put at once into vessels containing some disinfecting fluid, especially Condy's or chloride of lime, before being taken out of the room for the purpose of being washed. The clothes previously worn by a person suffering from a contagious disease ought also to be disinfected. The floor, doors, windows, &c., should likewise be frequently washed with some disinfectant. 7. *Food*, such as beef-tea, must on no account be allowed to remain for any length of time in the sick-room, and should never be taken by anyone who is not habitually in the apartment. 8. After the patient has left the room it should be thoroughly *cleansed* and *disinfected* in every corner, and then white-washed, or re-papered and painted. Sulphurous acid, chlorine, and carbolic acid are the most useful agents for disinfecting an unoccupied apartment. *Heat* is very valuable for disinfecting bedding and bed-clothes.

It is necessary to carry out these measures more or less thoroughly in proportion to the degree of contagiousness which the particular disease presents. For example, they demand strict attention in the case of scarlatina and small-pox.

When an *epidemic* has appeared in, or threatens to invade, a district, additional precautions are called for, as regards attention to proper hygienic conditions and other matters. Under these circumstances it is requisite to instruct ignorant individuals as to what course to pursue; and to appoint competent persons to visit from house to house, to see that the different measures are properly carried out, especially in low and crowded parts of towns and cities. The chief practical points to be noticed are as follows:—

1. *Cleanliness* must be strictly observed in every particular. Frequent washing and white-washing of premises is required. 2. All *over-crowding* must be prevented, and *free ventilation* insisted upon. It is particularly necessary to look to this among the poor, and in common lodging-houses or crowded alleys. 3. Persons who are likely to spread infection *must not mingle with others* in places of public resort. 4. Special attention must be paid to all *decomposing organic matter*, especially *house-refuse.* Everything of this description should, if possible, be at once removed, having been previously disinfected; or if it cannot be got rid of, abundance of disinfecting material must be mixed with it. House-drains and sinks, street-drains and sewers, water-closets, cess-pools, privies, ditches, &c., require careful and frequent examination, so that they may be kept in order. The earth in the neighbourhood of dwelling-houses is often saturated with organic matters, and therefore demands attention. During the removal of organic matters from houses, it is well for the inhabitants to keep away as much as possible. 5. *Disinfectants* should be freely employed in and around houses, especially where there is much filth. 6. It is most important to look to the source of the *water-supply*, particularly that which is used for drinking purposes, and to see that no organic matter finds its way into it from sewers, drains, cess-pools, polluted ground, &c. The waste-pipe of cisterns often opens into drains, and, owing to an imperfect state of the traps, organic matters become mixed with the water. This matter must be especially attended to during an epidemic of typhoid fever or cholera. On no account should water be taken which contains any organic matter, and it ought always to be filtered. 7. It may be advisable to *remove healthy persons* to some place where they would be free from the danger of infection. 8 If there is any known *preventive* of an epidemic disease, this must be at once resorted to, and fully carried out. Thus vaccination or re-vaccination should be thoroughly enforced during an epidemic of small-pox, in the case of all who have not previously undergone the operation. 9. It may be requisite to carry out the practice of *quarantine.* 10. It is important that the *general health* of the community should be maintained by every possible means, and all causes which tend to lower the system, such as intemperance or bad

living, should be avoided. It is particularly necessary for those who attend upon the sick to take every precaution for the preservation of health. They should live well, but not indulge too freely in stimulants; and they should never go near the sick person with an empty stomach. They require daily exercise in the open air, at the same time avoiding undue fatigue. They also need sufficient sleep, and must pay strict attention to cleanliness. 11. Any person who presents the *slightest symptoms* of the disease which is epidemic, ought to be *without delay* brought under medical treatment. 12. On no account should an individual suffering from an epidemic disease be *brought into the midst of a healthy locality*, if this can possibly be avoided. The conveying of such persons by *vehicles used by the public* is a serious crime, which is now punishable by law. Special conveyances are provided, should it be necessary to remove them to a hospital.

CHAPTER III.

ON THE CLINICAL INVESTIGATION OF ACUTE FEBRILE DISEASES.

A LARGE proportion of the cases which come under observation in ordinary practice belong to the class of *acute febrile diseases*, and it is most essential to have a clear understanding as to how to proceed in their investigation, because it is particularly important that a correct diagnosis should be arrived at in these cases as speedily as possible. The special points which require attention are as follows:—

1. It is well first to enquire what febrile complaints the patient has previously suffered from, if any. It should then be ascertained whether the patient has been exposed to any infectious disease; or whether there has been any other obvious cause at work likely to give rise to a febrile condition, *e.g.*, malaria or cold.

2. If possible, the *exact date*, *even the hour*, of the onset of symptoms must be fixed, and the *mode of invasion* ascertained.

3. The *symptoms* which have arisen in the course of the case are then to be inquired about, as well as the times at which they appeared; those being subsequently noted which are present at the time of examination of the patient. During their *premonitory* or *early stage*, the acute specific fevers are usually attended with certain *local symptoms*, differing in each complaint, and more or less characteristic. Those which require to be particularly investigated are:—the severity of general pains; the existence of any localized pain, especially in the back or epigastrium; catarrhal, throat, stomach, intestinal, and head symptoms. Of course if the pyrexia is due to inflammation of some organ or tissue, there will probably be local symptoms indicating the seat of mischief.

4. It is of the greatest importance to determine the *degree of pyrexia*, as well as its *course* and *mode of progress*. This is done by the

careful and systematic employment of the thermometer. In this way even at a very early period much assistance is gained in arriving at a diagnosis. In the *exanthemata* the fever is of the *continued* type. By its degree of intensity and rapidity of onset, the nature of the complaint may, in many cases, be foretold at an early stage. Each fever is supposed to have a definite course of temperature, and on the whole this is true; but a good many exceptions are met with.

5 Most of the *acute specific fevers* are attended with a *skin-eruption.* This constitutes one of their chief *anatomical characters,* and generally enables each of them to be at once distinguished from all others. It must be remembered, however, that the eruption is not always present, for there is no doubt but that scarlatina, measles, small-pox, and other exanthemata may run their course without any eruption. When due to inoculation, it may be confined to the spot where the morbid material is introduced, *e.g.*, vaccinia. The points to be ascertained with regard to any eruption are:—*a.* The *exact time* of its appearance after the first onset of symptoms. *b.* Its *primary seat,* as well as the parts of the body to which it spreads, and the mode and rapidity of its extension. *c.* Its ordinary *amount.* *d.* Its *precise characters,* from its first appearance to its decline, including any changes it may undergo during its progress. *e.* Its *duration,* both as regards the entire eruption, and its individual constituents. *f.* The cutaneous *sequelæ* which may follow it, such as desquamation. *g.* The chief *varieties* it may present.

6. In all febrile cases it is imperative to make a careful *physical examination* of all the chief organs of the body, and *to examine the urine.* This may reveal the cause of the pyrexia, even where there are no symptoms pointing to any particular organ. Besides, it must be borne in mind that even in the specific fevers complications are very liable to arise, or some of the organs may be primarily involved, and it is most important to detect any lesion in connection with these organs as soon as possible. Hence *daily examination* at least should be carried out, and in many cases it is requisite to examine the principal organs even more frequently than this. The *sphygmograph* is of value for indicating the condition of the circulation.

ON THE USE OF THE THERMOMETER.

The value of the *thermometer* in the investigation of disease is at present so generally recognized in theory, that it is unnecessary to enter into any discussion on this subject; at the same time it is desirable to impress upon all the extreme importance of employing this instrument in *daily practice,* because there can be no doubt that even now many do not use it to the extent which it deserves.

Neither is it requisite to give any detailed description of the instrument. All that need be said is, that the thermometer should be sensitive and accurate; of a sufficient range; self-registering; and of a convenient size to be carried in the waistcoat pocket.

These conditions are fulfilled in the *clinical thermometers* which are sold in most respectable instrument-shops.

Mode of use.—The regions usually employed for taking the temperature by means of the clinical thermometer are the axilla, the inner side of the upper part of the thigh, the mouth, rectum, or vagina. Sometimes it is requisite to notice *local* temperatures. The instrument must be kept in close contact with the surface, and completely covered. When the temperature is taken in either axilla, which is the most convenient place in most cases, the patient should lie on the same side, and press the arm firmly to the side; or it may be necessary to strap the thermometer to the surface by means of plaster. The mouth does not afford accurate results, but it may conveniently be made use of to give approximate information, the thermometer being placed under the tongue, and the mouth firmly closed. With regard to the time required for the instrument to be retained in its position, there is a difference of opinion. With proper precautions *five minutes* is usually sufficient, especially if "two observations at intervals of one or two minutes give exactly the same result" (Aitken). To be strictly accurate, however, many think that the mercury ought to *remain stationary for five minutes.* Baumler gives, in order to be scientifically correct —for the rectum, three to six minutes; mouth, nine to eleven minutes; axilla, eleven to twenty-four minutes.

It is desirable, if possible, that the individual upon whom the observation is made should have been at rest in bed for at least an hour previously.

The intervals at which the temperature should be taken will vary according to the nature of the case. Often only one observation is required. In most instances twice a day is sufficient, viz., in the morning and evening, and in many once daily is enough. Sometimes, however, it is most important to note the temperature at very frequent intervals, or even to allow the thermometer to remain constantly applied. Should this be needful, it is advisable to teach the nurse or some other intelligent person how to use the instrument, by whom it might also be employed if any unusual symptoms should arise. In all febrile cases it is requisite to have recourse to the thermometer until convalescence has been firmly established, for reasons to be presently indicated.

In using the thermometer the points to be observed are:—1. The *degree of heat,* as indicated by the *end of the index most distant* from the bulb of the instrument. 2. The *rapidity with which the mercury rises,* this being in proportion to the height of the temperature. It is often important to take a note at the same time of the *frequency of the pulse* and *respirations*; and in some cases to make a *quantitative analysis* of the urine, in order to determine whether there is a relation between the temperature and the amount of urea, uric acid, and other waste products discharged. All these observations should be recorded on proper forms, of which several have been planned, the temperature being indicated by angular lines or curves. It may be mentioned here that Fahrenheit's scale is followed throughout this work.

Temperature in health, and chief modifying influences.—In the axilla the temperature in health averages about 98·4° F. It may range, however, from 97·3° to 99·5° or even 100°, but if it goes beyond this in either direction, and remains persistently above or below the normal, there is something wrong. The chief circumstances which influence the temperature in health are as follows:—1. *The part of the body* in which it is taken. It is higher in internal parts, such as the rectum or back of the mouth, than in external parts; in sheltered regions of the body than those which are exposed; over the trunk than over the limbs. 2. *Age.*—The temperature, according to most observers, is higher in children and young persons than in adults. It is also said to rise in old age. 3. *Time of the day.*—During the day the temperature gradually rises until evening, and then falls slowly until early morning, when it again ascends. In this way there is a variation of about 1·5° during the twenty-four hours in adults, but the range is greater in children. 4. *Climate and exposure to heat or cold.*—In the tropics the average temperature is a little higher than in temperate or cold climates, and it may reach 99·5° or even 100° F. Long exposure to great heat or cold will also influence it to a slight degree. 5. *Food and drink.*—After a full meal the temperature at first falls, but it rises as digestion proceeds. Fasting lowers the temperature. Alcohol seems to cause a speedy fall, but this is only temporary, and a considerable quantity is required in order to influence the temperature materially. Certain articles of diet in daily use produce some effect, such as tea and coffee. 6. *Exercise* increases the temperature, especially that of the extremities, provided it is not sufficient to induce great fatigue. 7. Prolonged study and other forms of mental effort cause a slight depression. 8. Prof. A. B. Garrod has found that the temperature rises on stripping off the clothes and exposing the surface of the body, and the difference is greater in proportion to the coldness of the surrounding air. When the temperature of the air is above 70° F., there is a slight fall, but a rise to the previous temperature soon takes place.

The *chief source* of the animal heat is almost universally believed to be the chemical and vital changes in the food and tissues which are constantly going on in the body, the heat thus produced being diminished by evaporation from its surface, while the circulating blood renders the temperature tolerably uniform throughout the system. The influence of the nervous system upon temperature has been already considered. Dr. Beale believes that the *conversion of non-living into living material* is the cause of the production of heat.

The use of the thermometer in disease—In the great majority of cases disease tends to raise the temperature to an abnormal height, there being more or less *pyrexia*; and it is for the purpose of accurately determining the degree of this increased bodily heat that the thermometer is chiefly employed. Occasionally the animal heat sinks below the normal, or it may be unequal in different parts of the body, but these deviations are not nearly of so much consequence as a general rule.

At present it is only intended to sum up concisely the circumstances under which the thermometer may prove serviceable. The peculiarities which individual diseases present as regards temperature will be pointed out when these are severally discussed.

The information afforded by the thermometer may give valuable assistance in—1. Diagnosis; 2. Prognosis; 3. Treatment.

1. Much help is constantly derived from the thermometer with respect to *diagnosis*, and the following remarks may serve to gather up the circumstances under which it is thus useful. *a*. In many cases which present themselves in ordinary practice, where symptoms exist which might or might not belong to the premonitory stage of some acute illness, all doubt may at once be cleared up by taking the temperature. Thus we have frequently found in the out-patient room, that when symptoms suggestive of scarlatina or small-pox were complained of, by the help of the thermometer we have been enabled to negative the supposition of either of these diseases being present, or, on the other hand, to corroborate such a suspicion. In short, the instrument enables us at once to determine *whether pyrexia is present or not*, as well as its *degree*, and thus becomes a most valuable guide to the physician. *b*. Occasionally by one, or at most two observations, it is possible to ascertain positively the *nature of a fever*. For instance, if the temperature suddenly rises to 104° or 106° F., the patient having been quite well on the previous day, he is probably suffering from some form of malarial fever, and this is certain if the temperature falls rapidly, so that it becomes normal in a few hours. *c*. Many febrile disorders are now known to have tolerably *regular and uniform ranges of temperature* throughout their entire course, and to present peculiar diurnal and nocturnal variations, the temperature being, as in health, generally higher by night than by day. It is therefore essential to become acquainted with this portion of the *natural history* of each of these affections, and to employ the thermometer regularly in investigating them, so that they may be thus distinguished from each other, and from all complaints which may simulate them. *d*. The *habitual use* of the thermometer may lead to the discovery of disease when there is no obvious sign of its existence, for the fact of a patient presenting a temperature above the normal should always call for a more minute examination, which would probably lead to a satisfactory diagnosis. This has been frequently observed by those who employ the thermometer in lunatic asylums, who have thus detected phthisis in insane patients when they could not otherwise have suspected it. *e*. *Complications* occurring during the progress of fevers or during the period of convalescence, as well as *relapses*, are indicated by a disturbance of the typical range; by delayed defervescence; or by a rise in temperature after it has once subsided; and either of these deviations may be the first thing observed. Hence the necessity of taking a daily note of the temperature until the patient has perfectly recovered. *f*. In certain diseases the thermometer gives information as to the *active progress* of a morbid process *e.g.*, in tubercular affections. Further, it may serve to distinguish between *different forms* of a particular affection;

thus *pulmonary phthisis* may be the result of different pathological conditions, and it is probable that these are characterized by distinct types of temperature. Again, in connection with hæmoptysis, the thermometer is useful in indicating inflammation which may be set up by blood extravasated into the respiratory organs. The same remark applies to the effects of an apoplectic clot in the brain. *g*. *Inequality of temperature* is sometimes of aid in diagnosing paralysis or other nervous disorders.

A word of caution is necessary with regard to children. In these subjects the temperature may run up rapidly to a considerable height, when there is nothing very particular the matter, and therefore care must be taken not to jump to a hasty diagnosis of some serious disease, simply because the thermometer indicates much pyrexial heat. It often falls with equal rapidity.

2. The temperature may be of use in assisting towards a *prognosis*, either in itself; or from its relation to the pulse, respirations, or amount of excreta; or from its association with other symptoms. *a*. The *degree of heat* observed during the early period of a febrile disease, especially when taken in conjunction with the prominent symptoms, will often give a good idea as to whether the particular case under observation is likely to be a severe one or not. If the temperature is at all high, it shows that a sharp attack may be anticipated, and that complications resulting from the presence of products of decomposition in the blood are liable to arise; therefore a guarded prognosis should be given. *b*. A *very high* temperature, especially when it exhibits a tendency to a continuous and rapid rise, is extremely dangerous, especially if the excretions are deficient. *c*. A *sudden change* in the temperature may be premonitory of some coming event, even for some days before this actually occurs. Thus a marked fall in typhoid fever not uncommonly precedes hæmorrhage from the bowels, and gives warning of its approach. *d*. If the temperature *does not increase*, or if it *falls from morning to evening*, this is a favourable sign; if it is *higher in the morning* than on the previous evening, this shows that the disease is advancing, and the prognosis is consequently more grave. *e*. In many pyrexial diseases the fever usually subsides on certain days, often by *crisis*; if in a particular case the expected fall takes place, and defervescence goes on regularly and continuously, the prognosis is favourable; if the contrary happens, or if the decline of the fever is irregular, an unfavourable course is indicated *f*. Should the temperature *decline rapidly* in certain acute febrile affections, such as pneumonia or typhus fever, while the pulse and respirations increase in frequency, and the other symptoms show no signs of improvement, but on the other hand become worse, the prognosis is very serious. A very low temperature is in itself an evil omen.

It must be remembered that accidental circumstances may temporarily modify the temperature in disease as in health, such as food, exercise, excitement, &c. It may be increased by sources of irritation, *e.g.*, retained urine or fæces, on the removal of such irritants being often markedly reduced. Defervescence may proceed so far that the animal heat is brought below the normal, sometimes considerably. After convalescence from severe continued fevers, the temperature is often low for some time. The same condition is also observed during the apyrexial periods of intermittent fever; and in the remissions of the remittent variety.

3. The value of the thermometer as indicating *treatment* may be gathered from the remarks already made, and it will be only necessary to give two or three illustrations. A *very high and ascending temperature* calls for prompt recourse to the use of cold, as already described under the treatment of pyrexia. In *ague*, after this disease has apparently subsided, it is found that the temperature still rises at the usual intervals, and until this has become quite normal for two or three days, treatment must not be discontinued. During *convalescence from fevers*, an increase of heat may be due to something wrong in the diet or in the use of medicines, and it should lead to careful inquiry on all matters which might tend to raise the temperature, so that appropriate measures might be adopted.

CHAPTER IV.*

SIMPLE CONTINUED FEVER—FEBRICULA—SYNOCHA.

A CONSIDERABLE number of cases come under observation in ordinary practice, which present the usual symptoms of *fever*, but which cannot be referred to any of the contagious fevers, nor can the symptoms be traced to any adequate local cause. Besides these there are not uncommonly anomalous forms, to which various names have been applied. Though many of these cases scarcely come under the class of acute specific fevers, they may conveniently be described here.

ÆTIOLOGY.—Simple febricula does not seem to be contagious, or to depend upon any specific poison as a rule. It may result from cold; excessive heat, such as prolonged exposure to the sun; overeating or drinking; or great fatigue. In many instances no distinct cause can be made out. Probably some cases of so-called febricula result from the action of one of the contagious poisons, modified by the constitutional condition of the individual, or by the quantity entering the system being very minute. I have known a severe epidemic of typhoid fever to be preceded by cases of mere febricula.

SYMPTOMS.—Febricula is characterized by the ordinary signs of *fever*, in their most typical and simple form, but of variable intensity. The *invasion* is indicated either by chilliness or slight rigors, with general pains, lassitude, and headache. Afterwards the skin becomes hot and dry; and the pulse frequent and full. Severe headache is usually complained of, the face is flushed, while the patient is restless, and sometimes a little delirious at night. There is thirst, with a furred tongue, loss of appetite, and constipation. The urine presents febrile characters. Frequently symptoms are present indicative of catarrh of the mucous membranes, but these are not sufficient to account for the pyrexia. Roseolar or erythematous eruptions have been observed in some instances, and in others certain bluish spots.

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* In the description of the individual *Acute specific diseases* in the following pages, I have deemed it expedient to omit the consideration of the *diagnosis* under each particular affection, and to devote a separate chapter to a general summary of this subject.

The *temperature* rapidly ascends, and it may reach 102°, 103°, or even 104° in a few hours. This high temperature, however, only lasts for a short time usually, often but a few hours, or at most one or two days, and then it falls rapidly.

DURATION and TERMINATION.—The *duration* of febricula is generally about three or four days, but a case may last a week or ten days before convalescence is complete. Defervescence usually takes place by *crisis*, the temperature falling to the normal in from 24 to 36 hours, there being also a copious discharge of urine, with abundant deposit of lithates; free perspiration; and sometimes diarrhœa or epistaxis. Occasionally defervescence takes place by *lysis*, convalescence being consequently delayed. The *termination* is always in recovery.

TREATMENT.—All that is required is to keep the patient in bed; to give a diet of milk and beef tea, with cooling drinks; to open the bowels freely; and to administer some simple saline mixture, such as a solution of *citrate of potash*, or *liquor ammoniæ acetatis*. If there is much heat of skin, tepid sponging is very useful. During convalescence *quinine* may be given.

CHAPTER V.

TYPHUS FEVER.

ÆTIOLOGY.—Typhus fever is generated by a *specific poison*, and is highly contagious. This poison is principally given off in the exhalations from the skin and lungs, being afterwards inhaled or swallowed. The cutaneous exhalations have a peculiar odour. Infection is far more likely to happen in the case of those who are brought into close and frequent contact with the sick, and hence nurses and medical men are very liable to be attacked. It must be borne in mind, however, that if there are a number of cases congregated together, so that the poison is concentrated, a very short, even a momentary, exposure may cause the disease to be transmitted. The contagious influence does not seem to spread to any great distance, and is much weakened by dilution with air. In well-ventilated private houses typhus fever rarely spreads, and it never extends from hospitals to adjacent streets. It is more likely to pass from a low storey to a higher one, than in the contrary direction. Fomites, such as clothing, bedding, furniture, or the walls of rooms, may retain the contagium for some time if not properly disinfected, and may thus subsequently originate the disease in the same place, or convey it to other districts. Woollen and dark-coloured materials are said to take up the poison most readily. Typhus fever is stated to be most contagious during the period of convalescence, but infection probably lasts from the end of the first week until convalescence is established. A second attack is an exceedingly rare event.

The opinion is strongly held by some eminent observers, that typhus fever may be developed *de novo*, independently of any infection, in consequence of great over-crowding and destitution.

Predisposing causes.—There are certain circumstances which greatly intensify the action of the typhus contagium, or render individuals more liable to be attacked. These are:—1. A low physical condition, induced by intemperance and bad feeding, or by chronic disease. 2. Over-crowding and deficient ventilation, especially over-crowding of dwelling-houses, or of individuals in the same house or room, along with bad ventilation. 3. Want of cleanliness, domestic and personal. 4. Mental depression, from over-work or anxiety, or fear of contagion. 5. A temperature not too high. In consequence of the action of these causes, typhus fever is infinitely most prevalent amongst the poor; in the crowded parts of large towns, especially in those places where the sanitary arrangements are inefficient; in low regions; in crowded camps or dwelling-houses, such as low lodgings; and in cold and temperate climates. Epidemics are also very apt to arise during periods of distress and famine from any cause. Typhus seems to be much more rife in Great Britain and Ireland than in other countries, and it is stated not to occur within the tropics. Mental causes appear chiefly to affect persons belonging to the better grades of society. Something may probably be attributed to *individual susceptibility*, certain persons being more prone to be attacked than others.

ANATOMICAL CHARACTERS.—The blood is much altered in typhus fever. It either remains fluid or forms very soft clots, and tends to decompose rapidly. The fibrin is diminished, and the red corpuscles, which are increased in number at first, afterwards become deficient. The salts are in excess, while urea and ammonia are present, the latter being supposed to result from the decomposition of the former. Under the microscope the red discs are seen to be irregular in form and crenated, and they collect in amorphous heaps. The colouring matter transudes, and tinges more or less the various tissues and the fluid contained in serous cavities.

The body does not usually present much emaciation, but decomposes speedily. The maculæ on the skin which are observed during life are frequently persistent after death.

The voluntary muscles are of a dark colour and softened. Their fibres often exhibit signs of degeneration under the microscope. Sometimes they are the seat of hæmorrhages. Similar softening with fatty degeneration is observed to a marked degree in the heart. It is believed also that the same change occurs in connection with the involuntary muscular tissue generally.

There is nothing characteristic in the brain. There may be some congestion and excess of serum, and occasionally slight arachnoïd hæmorrhage has been observed. In some epidemics signs of cerebro-spinal meningitis have been described.

All the organs are commonly hyperæmic, softened, friable, and enlarged, especially the liver and spleen; the latter may be quite pulpy, but does not reach a very great size. The salivary glands are frequently inflamed, and may be the seat of suppuration or gangrene. Acute nephritis is sometimes observed.

In the alimentary canal the appearances which may be met with are redness and softening of the gastric mucous membrane; congestion or inflammation of that lining the intestines, especially the colon; and enlargement of the glands, which is particularly noticed in children. There is nothing characteristic in these appearances, nor is there ever any deposit or ulceration such as typhoid fever presents.

There may be various lesions of the nature of *complications.* Bronchitis is very commonly observed, as well as hypostatic congestion of the lungs, which may end in hypostatic pneumonia. Sometimes ordinary acute pneumonia is present.

SYMPTOMS. I. *Incubation stage.*—The *period of incubation* is usually from nine to twelve days, but it may not go beyond six days. During this time there may be such symptoms as chilliness, general pains and malaise, restlessness, headache, and loss of appetite, but these may be entirely absent, and are not significant.

II. *Actual attack*:—1. *Invasion stage.*—The invasion may be singularly sudden, as I know from personal experience, and it is usually tolerably marked. The disease begins either with a series of slight or moderate rigors, or with one severe and prolonged fit of shivering, followed by pyrexial symptoms. The rigors often recur for two or three days. There is a marked sense of depression and exhaustion, the patient speedily taking to his bed, and presenting an aspect of weariness and heaviness, or even of considerable prostration. General muscular pains are complained of, and the limbs tremble on movement. Nervous symptoms are prominent. These are dull frontal headache, often severe, with a feeling of heaviness in the head, and throbbing; giddiness; more or less dulness of hearing, with noises in the ears; flashes of light and photophobia; sometimes an unpleasant smell; restlessness and disturbed unrefreshing sleep, though the patient is at the same time often very drowsy. The mind soon begins to wander, and becomes confused as to time, place, and surrounding circumstances and individuals, distinct delirium setting in from the fourth to the eighth day, which, however, is not constant at first, while the patient can be roused to answer questions. The delirium is most frequently of a dull and muttering character, but may be extremely active and excited at the outset, the patient being sometimes very violent. The expression is heavy and indifferent, the eyes are injected and suffused, and a more or less dusky flush covers the cheeks, the complexion having a dingy and dirty appearance.

Nausea and vomiting are sometimes present, and may be distressing symptoms. The tongue is at first covered with a thick white fur, but tends to become speedily dry and brown; it is often tremulous. There is much thirst, with total anorexia, and a disagreeable slimy taste in the mouth. The bowels are generally confined, but diarrhœa is not uncommon, the stools, however, presenting no peculiar characters, and being usually dark. Some degree of enlargement of the spleen can often be detected.

The skin feels hot and pungent. The pulse becomes frequent, rising steadily to 100 or more, and being often large and full, but very compressible; it may be small and weak, or dicrotic. The urine is markedly febrile.

Commonly there are signs of more or less catarrh of the nasal and respiratory mucous membranes, with cough and expectoration, and some dry râles may be heard over the chest.

2. *Eruptive-stage.*—Two forms of eruption are observed in typhus fever, viz:—*a subcuticular mottling;* and distinct *maculæ* or *mulberry spots.* Usually both are present in variable proportions, but the mottling is not unfrequently noticed without the spots, though the latter very rarely appear without the former. Children often do not exhibit any rash, and in them the mottling is most marked. The eruption usually appears on the 4th or 5th day, but may come out at any time from the 3rd to the 7th or 8th day. The back of the wrists, borders of the axillæ, and epigastrium exhibit it first; it then spreads rapidly over the trunk and limbs, but is rarely seen on the face and neck. *The rash is all out within one, two, or three days, and no fresh spots are developed after this, while each spot is perceptible until the entire rash disappears.* The *amount* varies considerably, but the maculæ are frequently very numerous, and may cover the skin almost completely.

Characters and Course. a. Maculæ or Mulberry Rash.—A number of distinct spots are first observed, varying in size from mere points to two or three lines in diameter, the larger being formed by the union of smaller ones. They are irregularly roundish, the larger spots being the more irregular, and their margin is ill-defined. They are quite superficial, and at first are often slightly raised, but this elevation subsides in a day or two. The colour is described as resembling the stains of mulberry juice, being as a rule at the onset of a brightish- or pinkish-red. It is deeper at the centre than at the margin, and completely disappears under pressure, returning again when the pressure is removed. In a few days the hue deepens, and may become purple or dark crimson or livid, especially towards the centre of the spots, which at the same time become more defined at their edge. This is especially observed over the back and other dependent parts. Pressure only diminishes the colour after three or four days, a light-yellow stain being left, and finally it does not affect it at all, the spots being in fact converted into true petechiæ, of an uniform hue. The eruption, viewed as a whole, has not an equal depth of colour.

b. Subcuticular Mottling.—This is most marked in dependent parts, and is described by Dr. George Buchanan as "a faint, irregular, dusky red, fine mottling, as if below the surface of the skin some little distance, and seen through a semi-opaque medium."

The *duration* of the rash varies. It usually subsides from the 14th to the 21st day. The *mottling* disappears more readily and sooner than the *spots*, and the latter remain longer if they become petechial. No desquamation follows the disappearance of the eruption.

The skin of dependent parts is more or less congested, especially that of the back. Miliary vesicles or sudamina may appear about the end of the second week, usually over the groins, subclavicular regions, or epigastrium. A peculiar odour is given off from the skin of persons suffering from typhus.

During the eruptive period most of the symptoms previously existing become worse, and tend to be of a low, adynamic, or typhoid character. The headache, however, usually subsides on or before the 10th day, and if it should continue along with marked delirium, this is a sign of danger, indicating some cerebral complication. Debility and prostration become very marked, the patient lying helplessly on his back, with the eyes closed or half-closed, in a state of muttering delirium, from which it is difficult or impossible to rouse him. Somnolence often sets in, which may be followed by complete stupor and coma. Muscular twitchings and trembling, rigidity, and picking at the bedclothes are frequently observed, and occasionally convulsions with strabismus. Sometimes coma-vigil is noticed, the patient lying with the eyes wide open, apparently awake, but staring vacantly into space. The complexion becomes muddy-looking, and a more dusky flush covers the face, which may be almost livid. The conjunctivæ are extremely injected and suffused, the pupils being often contracted. The skin of the extremities becomes cold and perspiring. The tongue is dry, brown, and cracked, or frequently even covered with a thick, blackish crust, and immovable; its surface is red and tends to bleed; while sordes cover the lips and teeth. Patients usually drink with avidity, but deglutition is difficult. The nostrils are stuffed up. Tympanitis is sometimes a prominent symptom. The pulse rises to 120, 140, 150, or more, but remains stationary after reaching a certain point; it becomes small and weak, and may be irregular. The heart's impulse and sounds are feeble, especially the systolic sound, and capillary stasis is very liable to arise. Respiration is much hurried and disturbed, being also frequently unduly abdominal. The breath has a peculiar and most unpleasant odour. Physical examination of the chest reveals bronchitic râles, or more serious complications may be detected. Incessant hiccup is sometimes a distressing symptom.

The urine is not uncommonly albuminous, or contains a little sugar; it may be retained or passed involuntarily along with the stools. Bed-sores are very liable to be produced over parts which are pressed upon.

The severity of the symptoms varies much in different cases, but if a case goes on to a fatal issue, prostration becomes more and more complete, the heart's force is exhausted, and the nervous symptoms indicate that the nerve-centres are still more disturbed. Before death the temperature may rise or fall rapidly, and in some instances the pulse suddenly falls. Complications may arise to hasten a fatal result.

3. *Stage of Defervescence.*—This sets in in cases of recovery from the 13th to the 17th day, generally at the end of the second week. There is a remarkable and sudden *crisis*, which often occurs at night, the patient falling into a deep sleep lasting for many hours, on awaking from which a wonderful improvement is observed in the aspect of the patient and in the symptoms. The temperature falls considerably, as well as the pulse, which gains in strength. The skin is soft and perspiring, the eruption less marked, and the complexion clearer. The tongue becomes moist and cleans from the edges, either in patches or molecularly, and there may be some inclination for food. Delirium ceases, the patient recognizes those around, but the mind is still confused, and entirely unconscious of all recent events. There is a sense of extreme weakness, and the limbs feel as if they did not belong to the body. Unless complications or sequelæ impede the favourable progress, convalescence begins at once, and the strength is regained comparatively rapidly, but it is some time before this is completely restored. The tongue soon cleans, and the appetite becomes perfectly ravenous; it is only those who have experienced it who can realize the extreme sense of hunger which is felt. Much sleep is indulged in, and the mind does not regain its normal vigour for some time. A relapse of typhus is extremely rare.

Temperature.—Different observers have described different ranges of temperature in typhus fever, and this appears to depend partly upon the nature of the epidemic. The *ascent* is steady and continuous up to the 4th or 5th evening, without any morning remission. The maximum temperature is rarely under 104·9° to 105°, often reaching 107°, or even above this. It may rise to 106° on the 3rd or 4th evening in severe cases; in slighter cases it may not be above 103·5°. A slight morning remission is observed on the 6th morning, and a well-marked fall occurs on the 7th day unless the case is very severe. After this a rise takes place again, but rarely to the former maximum. In fatal cases, however, it may go up to 108° or 109°. The temperature is *continuous* up to the *period of defervescence*, with a distinct but not considerable morning remission. This is more marked in cases where the temperature is high, and may average from $\frac{6}{10}$° to $1\frac{1}{2}$°. Dr. Buchanan states that it ranges from 1° to $1\frac{1}{8}$° until the middle of the 2nd week, and is afterwards about $1\frac{1}{2}$.° *Defervescence* is very rapid and sudden, setting in from the 13th to the 17th day, and the temperature may fall to or below the normal in 12, 24, or 48 hours. This event is often preceded by a rise above the temperature of the previous day. Occasionally after the sudden fall there is a rise of 2° or 3°, and then defervescence extends over some days. In short a combination of *crisis* and *lysis* is observed. As already mentioned, in fatal cases there is frequently a rapid elevation or sinking of temperature, and it may reach 109° on the one hand, or 95° on the other.

Some observers have found a relation between the temperature and pulse, but this is by no means constant or uniform, and the one may be high while the other is low.

VARIETIES.—Cases of typhus fever present considerable differences as regards their intensity and their prominent symptoms, to which special names have been applied. The *nervous*, *circulatory*, or *respiratory* system may appear to be most implicated. In some epidemics there has been a great tendency to gangrene, hence named *putrid fever*. Typhus fever may kill in a few days, by the direct action of its poison upon the system, before any local lesions have been developed. Niemeyer described mild cases, in which the earlier symptoms of typhus occurred, without any eruption or enlargement of the spleen, and in which convalescence set in at the end of a week.

COMPLICATIONS AND SEQUELÆ.—These should always be looked for and guarded against, as they may arise without any evident symptoms. The most important are:—1. *Affections of the respiratory organs*, viz., *bronchitis; pulmonary hypostatic congestion* or *consolidation*; pneumonia; gangrene of the lung (very rare); pleurisy; phthisis; laryngitis with œdema glottidis. 2. *Affections of the circulatory organs and blood. Cardiac softening and degeneration;* phlegmasia dolens; scurvy. 3. Partial paralysis, as a sequela, which is usually soon recovered from. 4. Dysentery in some epidemics. 5. Gangrene of the toes, nose, and other parts, especially during the winter; or cancrum oris in children. 6. Erysipelatous affections of the skin, throat, or deep tissues ending in suppuration. 7. Suppurative inflammation or bubos of the parotid or submaxillary glands, beginning in the cellular tissue around. 8. Inflammatory swelling and abscesses in various parts of the body. 9. Suppurative inflammation in joints. 10. Renal disease.

TERMINATIONS AND DURATION.—Most cases of typhus fever end in recovery. The *mortality* varies in different epidemics, but the average number of deaths is stated to be about 1 in 5. The average *duration* is about 14 days, but it may extend to 21 days; if beyond this, the prolonged course is due to complications. On the other hand the disease may run a much shorter course. Death may result either from coma or syncope, or, most commonly, from both causes combined; or it may be due to complications.

PROGNOSIS.—This is always grave, and a very guarded opinion should be given. The chief general circumstances which increase the danger of any particular case are as follows:—1. The patient being of middle or advanced age. 2. The male sex to some degree. 3, A low condition of the system, either constitutional, or due to privation or fatigue, intemperate habits, previous diseases, or other causes. The presence of the gouty diathesis is highly dangerous. 4. Mental depression, and a presentiment of death on the part of the patient. 5. Improper hygienic conditions, especially bad ventilation and over-crowding. 6. Neglect of proper treatment until a late period.

The *symptoms* and *complications* present afford most important indications as regards prognosis. Those of unfavourable import are:—1. Extreme prostration, with a dry, hard, and brown tongue;

marked tympanitis; or persistent hiccup. 2. Excessive feebleness of the heart's action, as evidenced by the impulse, sounds, and pulse; or very excited action, with weak pulse; or an exceedingly frequent pulse, which is at the same time extremely feeble, irregular, or intermittent. 3. Severe and early cerebral and other nervous symptoms, especially continued sleeplessness with delirium; deep coma or *coma-vigil*; muscular tremors, twitchings or rigidity, carphology, subsultus tendinum, *convulsions*, early relaxation of the sphincters, strabismus, and *great contraction of the pupils*. 4. A very high temperature, without any remission on the 7th day, especially if it persists and shows a tendency to rise; or a *sudden fall*, the other symptoms not improving. 5. A large amount and dark colour of the eruption, especially if mingled with numerous petechiæ, and if there is lividity of the face and limbs, with marked congestion in dependent parts. 6. Suppression or retention of urine; deficient elimination of its solid ingredients; the presence of much albumen or blood in the urine, especially if associated with casts: and particularly the early occurrence of these symptoms. 7. Signs of collapse. 8. Pulmonary inflammation, gangrene, erysipelas, and other dangerous complications.

TREATMENT.—The principles already laid down with regard to the treatment of *fever*, are those which must be followed in the management of cases of typhus. There is no possibility of stopping the disease in its course, and all that can be done is to assist nature towards a satisfactory termination.

It is most important to attend strictly to all the *hygienic conditions* which demand attention in contagious fevers, and particularly to look after every point connected with the sick-room, including the nursing. These matters are often of greater moment than any medicinal treatment, and always aid considerably in conducting a case to a successful issue, while they prevent the dissemination of the disease.

It may be laid down as an invariable rule of practice that patients suffering from typhus fever *will not bear any kind of lowering treatment*, but that they always need to be supported more or less, and their strength must be husbanded in every possible way. They should take to bed *at once*, and use no exertion whatever, on no account being permitted to get up to stool, but a bed-pan being employed. From the first a nutritious and easily assimilable *diet* must be administered, chiefly consisting of liquids, such as milk, beef-tea, chicken broth, &c. It is essential to give these at regular intervals, in considerable quantity, and *not to neglect them by night*.

Alcoholic stimulants are required in the great majority of cases, but they ought not to be given recklessly, the nature and quantity of the stimulant to be employed being determined by a careful consideration of each individual case. Port or sherry wine or spirits, especially brandy, answer best as a rule, and they should be given in stated doses at regular intervals, by night as well as by day. It is well to begin with a small quantity, and gradually to increase this as circumstances indicate, the amount being again reduced as the symptoms improve. Stimulants are not usually required during the first few days, but in the case of the aged, the intemperate, and those who are much debilitated from any cause, they are called for at the very outset. The signs which chiefly indicate the necessity for alcohol are:—1. A feeble state of the circulation, as shown by the pulse, the heart's impulse and sounds, a tendency to capillary stasis, or any disposition to syncopal attacks. 2. The existence of typhoid symptoms, the amount needed being usually in proportion to the intensity of these symptoms. 3. A large amount and dark colour of the eruption, with abundant petechiæ. 4. Profuse perspiration, the other symptoms not improving. 5. Coldness of the extremities. 6. The existence of complications of a low type. On the other hand, alcohol is contra-indicated or requires to be cautiously administered should there be a very hot and dry skin; symptoms of much cerebral excitement; or conditions of the urine pointing to deficient elimination on the part of the kidneys. In all cases the propriety of continuing or increasing stimulants must be judged of by the effects produced.

Therapeutic treatment.—If a case of typhus is seen at an early period, many recommend the administration of an emetic. The bowels should be kept open daily by some mild aperient, or by the use of simple enemata. In order to maintain *free elimination,* it is advisable to allow the patient plenty of drink, which may contain in solution *citrate of potash, nitre, cream of tartar,* or *chlorate of potash.* Tea, coffee, and salt are also given freely for this purpose. The medicines which have obtained most repute in the treatment of typhus are the dilute *mineral acids. Nitric, hydrochloric,* or a combination of these, *sulphuric,* and *phosphoric acids,* are those chiefly employed. They may either be made into a drink, or given in 10, 20, or 30 minim doses every three or fonr hours, along with *tincture of bark.* Sulphuric acid answers best when typhoid symptoms set in. *Quinine* in moderate doses is another valuable remedy, and it may be very advantageously combined with one of the mineral acids. *Tincture of iron* has also been highly recommended.

Various *antiseptics* have been tried, such as carbolic acid, sulphocarbolates, creosote, sulphites, Condy's fluid, and peroxide of hydrogen, but it does not appear that they can be relied upon.

Symptomatic treatment often demands considerable attention in cases of typhus fever. The symptoms which are likely to call for interference are excessive heat of skin; nausea and vomiting; thirst; constipation or diarrhœa; and head-symptoms, viz., headache, sleeplessness, delirium, stupor or coma. (For their treatment see pp. 88 to 90). Hiccup sometimes causes much distress. For its relief the best remedies are *sal volatile, ether, spirits of chloroform, hydrocyanic acid, camphor,* and *musk,* in various combinations. A sinapism may be applied over the epigastrium; or the ice-bag may be tried if necessary.

Should there be a tendency to marked prostration it is necessary to administer diffusible stimulants freely, such as *sulphuric* or *chloric ether, camphor, musk,* and *carbonate of ammonia,* along with alcohol. Sometimes patients become so low that they cannot swallow, and then recourse must be had to nutrient and stimulant enemata, which should be persevered in to the last.

It is always very important to look to the *bladder*, and to draw off the urine if necessary. The various *complications* met with must also be watched for, and every care taken to prevent them, especially *pulmonary complications* and *bed-sores*. As regards the treatment of inflammatory affections, it must be borne in mind that stimulants and tonics are always indicated when such complications set in in the course of typhus fever.

Much care is requisite during the stage of *convalescence*, all over-exertion being avoided, as well as excessive eating. Tonics and change of air are highly beneficial at this time. It is especially necessary to guard against any sudden effort during the early period of convalescence, as this is liable to cause coagulation of blood in some of the principal veins. Any *sequelæ* which may arise must, of course, be attended to, and treated by appropriate measures.

Chapter VI.

TYPHOID OR ENTERIC FEVER—PYTHOGENIC FEVER—ABDOMINAL TYPHUS.

Ætiology.—Typhoid fever originates from a *specific poison*, which is quite distinct from that causing typhus. Formerly they were looked upon as identical diseases, and a few still hold to this opinion.

There is abundant evidence to prove that typhoid fever is infectious, and when once it finds its way into the midst of a number of individuals, it tends to spread amongst them. It is most important, however, to understand clearly how the disease is mainly conveyed. The exhalations do not appear to contain much of the contagium, and there is very little danger from merely coming into the vicinity of patients suffering from typhoid. Indeed the probability is that the malady cannot be transmitted in this way, and medical men or nurses rarely take it from attending on patients. It is in the *fæces* that the poison is chiefly contained, and by their agency the disease is propagated. The atmosphere may become impregnated with the emanations from the excreta, either because the latter are thrown into some open space, or because the water-closets, privies, sewers, &c., are imperfect, and undoubtedly the poison may thus find its way into the system. *Water* is, however, the great channel by which it is conveyed, and numerous epidemics and endemics, as well as sporadic cases of typhoid fever, have been traced to some special water-supply. The materials may soak through the soil from cess-pits, or from being merely thrown on the ground, thus obtaining access into wells the water of which is used for drinking purposes; or they may find their way into cisterns through the waste-pipes. It has also been clearly proved that *milk* is not uncommonly the vehicle by which the typhoid poison reaches the system, either in consequence of water containing it being mixed with the milk, or from this article of diet becoming tainted in some other way with the excreta of patients suffering from the fever. Fomites may convey the disease, but only through becoming contaminated with the typhoid stools.

The name *pythogenic* has been given to typhoid fever by Dr. Murchison, who, with others, is strongly of opinion that this complaint is as a rule *spontaneously* originated in connection with ordinary sewer emanations and putrefying animal matter, and he believes that even in the specific stools the poison is always a product of decomposition.

With regard to the precise nature of the typhoid contagium, the investigations of Klein seemed to have led to the discovery of peculiar organisms of the nature of fungi. The more recent observations of Dr. Creighton have, however, disproved the existence of any such organisms.

Predisposing causes. Age materially influences the occurrence of typhoid fever. It is by far most common during youth and adolescence, being very rare in young infants, and in persons beyond 45 or 50 years of age. Individuals under 30 are twice as liable as those over 30, and half the cases occur from 15 to 25 (Murchison). Sex does not seem to have any effect. Cases are most numerous during autumn, especially after a dry and hot summer. Over-crowding is not a predisposing cause of typhoid, but deficient ventilation may have some influence. The disease attacks persons in all classes of society, and is not at all more prevalent among the poor; if anything, the contrary is the case. Individual susceptibility is believed to predispose; and recent comers into an infected district are said to be most liable to be affected. Persons in good health are often attacked before others; while various chronic and acute diseases, as well as pregnancy, seem to afford some protection against typhoid.

ANATOMICAL CHARACTERS.—The general condition of the body will vary with the time at which death occurs. Usually there is more or less emaciation; rigor mortis is distinct and of moderate duration; while the excessive *post-mortem* congestion, rapid putrefaction, and dark colour with softening of the muscles, usually characteristic of typhus fever, are not observed in typhoid. The eruption is not persistent after death, but there may be the remains of bed-sores, gangrene, erysipelas, or sudamina.

Alimentary canal.—It is here that the most important morbid changes are found in enteric fever. The *pharynx* and *œsophagus* may be congested, inflamed, covered with diphtheritic deposit, or the seat of ulceration. The ulcers are generally very superficial, and are never met with before the third week. They are not the result of any morbid deposit. The *stomach* occasionally presents hyperæmia, mammillation, softening, or superficial ulceration, but is usually normal.

The *small intestines* are only rarely distended with gas; but they contain more or less of the materials similar to those passed in the stools. Increased vascularity of the mucous membrane may be observed, either uniform or in patches, but this is by no means necessary; it is most evident towards the lower part. At a later period the colour may be greyish or slate-coloured. The membrane is sometimes swollen and softened, the latter being probably a *post-mortem* change.

The characteristic lesions of enteric fever consist in *certain morbid changes in connection with Peyer's patches and the solitary glands.* These structures present different appearances, according to the time at which death occurs, the morbid changes being divided into certain well-defined stages.

1. *Stage of deposition* or *enlargement.*—The first alteration observed is an enlargement of Peyer's patches and of the solitary glands, owing to the presence of a morbid substance, supposed by some to be of the nature of a specific deposit from the blood undergoing a peculiar development, but generally considered to be the result of a proliferation of the previously existing cell-elements. The material is made up chiefly of granular matter and oil-globules, with a variable number of cells, having no special characters. It is probably first formed within the glandular sacs, but these may burst and discharge their contents into the surrounding cellular tissue, or there may be an increase of cells here also.

It is a matter of doubt at what period the glandular enlargement commences, and whether it is preceded by hyperæmia. Murchison states there is no previous congestion, and that a deposit has been met with on the 1st or 2nd day, but Trousseau gives the 4th or 5th day as the time of its appearance.

Peyer's patches appear to be unduly prominent, being raised one or two lines or more above the level of the mucous membrane, and having steep edges, with a smooth or granular surface; they are more or less firm, though the membrane covering them is often softened; while they vary in colour from pinkish-grey to different hues of red, the mucous membrane over them being sometimes purplish, and each patch is surrounded by a vascular ring. The corresponding peritoneum is also injected. The substance seems to be adherent to the mucous and muscular coats. On section it appears as a soft, greyish-white, or pale-reddish material.

Two forms of patches are described, the *plaques molles* and the *plaques dures*, but there are gradations between them, and they may coexist. The latter are more prominent and firmer, and the membrane over them is smoother and more uniform. The differences between the two kinds are, that in the *plaques molles* the deposit is less abundant, and is confined to the glands, which in the *plaques dures* have burst and discharged their contents (Murchison).

The solitary glands are not always involved. In exceptional instances they may be alone affected. They vary in size from a millet-seed to a pea, and sometimes look like pustules.

2. *Stage of destruction.*—In rare instances it appears possible for the material to be re-absorbed, without any breach of surface occurring. Almost always, however, ulceration takes place, the average time at which this process begins being about the 9th or 10th day,

but it may commence much earlier or later than this. Each ulcer is commonly the result of the death of a Peyer's patch and of the membrane covering it, the whole separating as a single slough, or in separate irregular portions. These sloughs are usually yellowish or yellowish-brown from staining, or they are sometimes discoloured by blood; they are occasionally seen in process of separation, hanging loosely. There may be mere superficial abrasion and softening of the mucous membrane, preceding ulceration. Sometimes the glands simply rupture and discharge their contents, giving rise to a net-like appearance, and Aitken believes that this is the most frequent mode of elimination of the softened deposit. The solitary glands undergo a similar destructive change; and it may also spread to the mucous membrane between the glands.

3 *Stage of ulceration.*—The characters of *typhoid ulcers* are as follows:—In length they usually vary from a line to 1½ inch, but if several ulcers join, a surface of some inches may be involved. The shape is oval or elliptical, round, or irregular, according as the ulcer corresponds to a Peyer's patch, to a solitary gland, or to several patches or glands united. There is never any thickening or hardening of the edges or floor, nor is any morbid deposit observed here. The margin consists of a "well-defined fringe of mucous membrane, detached from the submucous tissue, a line or more in width, and of a purple or slate-grey colour; this is best seen when the bowel is floated in water" (Murchison). The floor is formed either by the submucous, muscular, or peritoneal coat, the ulcer accordingly varying in depth. Those ulcers which correspond to Peyer's patches occupy the part of the intestine most distant from the mesentery, and their long diameter is longitudinal and not transverse, as regards the direction of the intestine.

4. *Stage of cicatrization.*—This stage commences usually about the end of the third week, but it may be delayed considerably beyond this period, the ulcers becoming chronic or atonic. Each ulcer takes about a fortnight to cicatrize. Healing is accomplished without any puckering, contraction, or constriction of the gut. A thin transparent layer of lymph forms on the surface of the ulcer, by which the mucous membrane becomes gradually attached to its floor from the periphery to the centre, and into which at last it passes imperceptibly. The cicatrix is slightly depressed, thinner at the centre than at the circumference, pale, smooth, and translucent. After a time the mucous membrane may become movable, and it is said that villi may form, but if the glands are destroyed, it is very unlikely that these ever become renewed.

The changes above described begin first, and are most extensive and most advanced, in that portion of the intestine in which Peyer's patches are most evident, viz., in the lower portion of the ileum, and from this point they gradually extend upwards, until ultimately they may occupy the lower third of the small intestine. The extent of the disease is, however, very variable, the number of patches involved ranging from 2 or 3 to 30 or 40. Generally at a *post-mortem* examination different stages of the morbid process are visible in different parts, it being most advanced below, where the most extensive ulcerations are observed. At the upper part there is usually a somewhat abrupt transition from diseased to healthy patches, and all those below the first diseased patch are generally involved. The solitary glands are as a rule only implicated in the lower 12 inches of the gut, and they ulcerate later than the patches. They are more liable to be attacked in children.

Intestinal perforation is an event to be dreaded in connection with typhoid ulcers. It may be brought about in the following ways:—1. Most frequently by molecular disintegration, or an extension of ulceration, producing one or more minute, round apertures, like pin-holes. 2. By more or less extensive sloughing, involving the peritoneum, the slough separating partially or completely, and leaving an opening of variable size. 3. By rupture or laceration, leading to an elongated perforation, and this may happen even after cicatrization has been completed. Generally there is but one perforation, but occasionally two, three, or more have been observed. In most cases the opening is in the lower portion of the ileum, but it may be higher up, or in the large intestines.

If a case of typhoid fever has a very prolonged duration, it is said that the coats of the intestine, as well as the glandular structures, become considerably atrophied.

Large intestines.—These are usually distended with gas, sometimes to an extreme degree. The mucous lining may be congested or softened. Deposit and ulceration not infrequently occur in connection with the solitary glands, these morbid changes being as a rule limited to the cœcum and ascending colon. The ulcers are generally small and circular, but may be 1½ inch long, with the long diameter transverse. In one fatal case which came under my notice, the morbid appearances were observed chiefly in the cœcum and ascending colon, where there were at least 20 ulcers, some as large as half-a-crown, while in the small intestines there were not altogether above half-a-dozen, and these were confined to the solitary glands, Peyer's patches presenting but little alteration. I have recently met with a somewhat similar case.

Absorbent glands.—The *mesenteric glands* always present important changes, these being associated with the morbid conditions in the intestines, and being most marked in those glands which correspond to the part of the gut most diseased. They become enlarged at the very outset, not merely as the result of irritation, but from an increase in their lymphatic elements, similar to that which occurs in the intestinal glands. They continue to enlarge up to the 10th or 14th day, present a red or purplish colour, and feel tolerably firm. On section little opaque, pale-yellow, friable masses are sometimes seen. Subsequently these may soften into a pus-like fluid mixed with sloughs, and the glands in rare instances actually burst into the peritoneum. After the softening process begins in the intestinal glands, the mesenteric glands also soften and become smaller. Ultimately they frequently become tough, contracted and shrivelled, pale or of a grey or bluish colour, and occasionally they calcify. The *mesocolic glands* are similarly altered when the colon is involved. Other glands may enlarge from irritation.

Spleen.—This organ is almost always much enlarged, especially in young persons, very dark in colour, and softened. Sometimes it contains opaque yellowish-white masses. It may be quite pulpy, and has been known to rupture.

Liver and Gall-bladder.—The liver is sometimes congested or softened. The gall-bladder may be the seat of catarrhal or diphtheritic inflammation, or of ulceration. After three or four weeks the bile is often thin, watery, almost colourless, and acid in reaction.

Peritoneum.—Peritonitis is not uncommon, and may be either extensive or circumscribed, limited abscesses sometimes forming. It may arise from mere extension of irritation from the bowel; intestinal perforation; rupture of glands or of the spleen; or perforation of an ulcer in the gall-bladder.

Urinary organs.—The kidneys are sometimes congested; or they may have their tubes choked up with detached epithelium. The mucous coat of the bladder may be congested or inflamed.

Blood and Organs of circulation.—There is nothing very special here. The blood is dark and fluid, and does not coagulate, if there have been typhoid symptoms before death, but these characters are rare in typhoid fever compared with typhus. The white corpuscles are increased, and disintegrating red corpuscles are sometimes seen. The heart may be a little softened.

Respiratory organs.—There may be congestion, various forms of inflammation, œdema, or ulceration of the larynx, the last-mentioned not being due to any specific deposit. Signs of bronchitis, hypostatic pulmonary congestion or œdema, pneumonia, or pleurisy may be evident. The bronchial glands are sometimes enlarged.

Nervous system.—This presents no particular alterations. There may be excess of serum in connection with the brain and its membranes.

SYMPTOMS. I. *Incubation stage.*—The *period of incubation* in typhoid fever is of doubtful duration. It most frequently extends beyond 10 days, and may be much longer than this. There are no distinctive symptoms. Sometimes the incubation-period appears to be very short if the poison is concentrated, the disease setting in with vomiting and purging, attacking a number of persons at the same time, and giving rise to a suspicion of irritant poisoning.

II. *Actual attack.*—It is scarcely possible to divide this affection into distinct stages, but at the same time it often presents periods in its progress, which are marked by tolerably characteristic phenomena. The *invasion* is ordinarily *very indefinite and gradual,* and the patient cannot fix the exact date of the commencement of the attack. Frontal headache, with giddiness and noises in the ears; general pains in the limbs, with a feeling of lassitude and illness; restlessness and disturbed sleep; slight, irregular chills; diarrhœa, with loss of appetite, furred tongue, and not uncommonly nausea and vomiting, are the ordinary symptoms. Sometimes there is much abdominal pain. Diarrhœa may be the only prominent symptom for some time. Occasionally repeated epistaxis occurs. Soon there are signs of pyrexia, increasing towards evening. It frequently happens that the patient does not feel sufficiently ill to take to bed for some days, but follows his occupation, and it is not an uncommon event for patients to come to the hospital after having been poorly for many days, thinking there is not much the matter with them, while they sometimes walk about during the entire illness. Murchison has seen cases in which at first the symptoms of typhoid fever resembled those of ague.

Early stage. The disease being established, the symptoms present during the first week or ten days are as follows:—

The *general appearance* does not indicate any great prostration, and though a certain degree of depression is felt, it is not very marked. The expression presents nothing peculiar, and the face is normal in colour, or pale, or a pink circumscribed flush may be noticed on one or both cheeks, varying in depth of tint, and not constant. There is pyrexia, the skin being hot and usually dry, but sometimes moist; while the pulse is accelerated to 100 or 120, and somewhat weak and soft; it varies in frequency in the same patient, being readily quickened, and it is generally more rapid at night. The tongue presents usually a thin whitish fur, is moist at first, small and pointed, red at the tip and edges, with enlarged papillæ. In exceptional cases it is large and thickly coated; or red, smooth, and glazed. The lips are parched and dry, and the mouth feels slimy. There is much thirst, with loss of appetite, and often nausea and vomiting.

Abdominal symptoms are prominent as a rule. These are pain and tenderness, especially in the right iliac fossa; more or less tympanitic distension; gurgling on pressure in the right iliac fossa; and diarrhœa. *Physical examination* reveals enlargement of the spleen. Sometimes intestinal hæmorrhage occurs. The diarrhœa varies in amount considerably, the stools numbering from two to twelve, twenty, or more in the twenty-four hours. Usually they range from three to six. At first the fæces present no peculiarities, but after a few days they assume special characters, becoming thin, yellow, pultaceous, and somewhat resembling pea-soup in appearance; very offensive, and often ammoniacal; and alkaline in reaction. Uniform throughout when first passed, they separate on standing into an upper watery layer, of a yellowish or brownish colour, containing albumen and salts in solution, the latter including chloride of sodium and carbonate of ammonia; and a lower layer or deposit, consisting of the remains of food, epithelium and mucus corpuscles, blood, small yellow flocculi, shreds of slough, and crystals of triple phosphates.

Head symptoms are not very marked at this time. Frontal headache persists, with dizziness and buzzing in the ears. Sleep is restless and disturbed, but the mind is clear though inactive, and there is no delirium even at night. Epistaxis is not an uncommon symptom during this period.

The *urine* presents well-marked febrile characters; urea and uric acid are in excess; and chloride of sodium is diminished.

Frequently there are slight bronchitic symptoms, dry râles being also heard over the chest.

Eruption. A *specific eruption* is present in the great majority of cases, but not invariably. It is not unfrequently absent in very young patients, and in persons over 30. It first appears usually from the 7th to the 12th day, but may in rare instances be seen as early as the 4th, or not until the 20th. The abdomen, chest, and back are the regions which it generally occupies, but it is occasionally observed on the limbs, or very rarely on the face. It does not appear all at once, but comes out in successive crops, each spot lasting from two to five days, and then fading away completely. The amount of eruption present at one time is never great, the number of spots rarely exceeding from 12 to 20 or 30, and there may be but two or three. They continue to come out often until the 28th or 30th day, or sometimes even much later than this. Murchison found the average total duration of the eruption to be about 14½ days. It appears earlier, and lasts a shorter time in children.

The *typhoid rash* consists of separate spots; round, lenticular, or oval in shape; and varying in diameter from ½ a line to 2 lines. They are slightly but distinctly elevated as a rule; rounded on the surface; having a well-defined margin, and a soft feel. They present a pinkish or rose colour, which throughout their whole course disappears completely on pressure, and which gradually fades away. Petechiæ are never observed. In very rare instances the spots are minutely vesicular. They never persist after death.

Advanced stage. The symptoms thus far described may continue without any particular change until convalescence sets in, the tongue remaining moist throughout, and there being no marked prostration or severe nervous symptoms. Usually, however, the phenomena change more or less. The patient emaciates and becomes much weaker, being sometimes very prostrate at last. The face is more flushed, the conjunctivæ may be injected, and the pupils are dilated. The fever continues, and the pulse becomes more frequent but weaker. The tongue tends to become dry and brown, or red, shining, and deeply fissured; while sordes collect on the lips and teeth, the breath having a very disagreeable odour. Labial herpes is not uncommonly observed. There is no diminution in the abdominal symptoms, which indeed are often intensified, and hæmorrhage from the bowels is liable to occur. The spleen also becomes larger.

The *nervous symptoms* undergo a marked change. From the 10th to the 14th day the headache and general pains cease, but there is more giddiness, with deafness. The mind also becomes affected, as indicated by more or less somnolence, mental confusion, or delirium. The latter is at first only nocturnal, but may become continuous, though it is usually worse at night, while drowsiness is more marked by day. The delirium is generally of an active, noisy, and talkative kind at the outset, and may be very violent, the patient throwing off the bed-clothes, trying to get up constantly, and having various delusions. Sometimes the patient lies in an apathetic state, with half-closed eyes, appearing to understand what is said and done, but unable to make intelligible replies. Epistaxis is not uncommon at this time.

Sudamina often appear, usually in the third or fourth week, especially over the chest and abdomen, and on the sides of the neck. Bed-sores are liable to form in parts which are pressed upon.

The *respirations* become hurried and shallow, and there are more marked signs of *bronchial catarrh.* The *urine* becomes more abundant, lighter in colour, and of lower specific gravity; slight albuminuria may set in, but is not very common. Sometimes the urine is retained, or is passed involuntarily with the stools. Rarely it contains blood, renal epithelium, or casts.

In some cases the ordinary symptoms characteristic of the *typhoid state* are developed, petechiæ at the same time occasionally making their appearance, but this is an unusual course of events.

When typhoid fever ends in recovery, it presents a *gradual* subsidence of the symptoms, defervescence taking place by *lysis,* and not by *crisis.* Convalescence makes slow progress, and is liable to be retarded by a *relapse,* as well as by *complications* or *sequelæ.*

Temperature.—Typhoid fever presents some very characteristic features as regards its temperature. The *ascent* is quite regular and gradual, and continues for four or five days. *The evening temperature is about* 2° *higher than that of the morning, and there is a remission each morning of about* 1° *compared with the previous evening,* so that *there is a daily rise of about* 1°, and at last the evening temperature comes to be from 103·5° to 104° or more. This mode of ascent is quite distinctive of typhoid.

The *stationary* period varies greatly in duration according to the severity of the case. The temperature ranges usually between 104° and 106° in the evenings, and only a *slight morning remission* is observed. It may reach 107°, 108°, or even above this.

The *decline* is also peculiar. Defervescence takes place gradually, and is first indicated by a *more distinct morning remission;* in three or four days the evening temperature falls, and the morning remissions become very considerable, a difference of 2°, 3°, or even more being observed. The time taken to reach complete defervescence, so that the evening temperature is normal, varies much. *Complications* and *sequelæ* also not uncommonly lead to irregularities; and a *relapse* may cause the temperature again to rise in the same regular manner as at first.

VARIETIES.—Remarkable differences are observed in cases of typhoid fever, both as regards their degree of severity, and the prominent symptoms which they present. There may be no abdominal or other characteristic symptoms from first to last; and instead of diarrhœa there may be constipation throughout.

Murchison gives the following varieties:—

1. *The mild form,* under which would be included the *abortive* variety of certain writers, which ends in the second or at the beginning of the third week; as well as some cases considered to be of the nature of *febricula.*

2. *The grave form,* which according to the prominent symptoms present is subdivided into—*inflammatory, ataxic, adynamic, irritative, abdominal, thoracic,* and *hæmorrhagic.*

3. *The insidious* or *latent form,* also called *ambulatory,* because the

patient often walks about during the entire attack. Sudden death may occur in such cases from perforation or hæmorrhage.

In addition to these varieties, there can be no doubt but that cases of so-called *infantile remittent fever* and *gastric* or *bilious fever* are frequently merely those of modified typhoid fever.

Complications and Sequelæ.—Affections of the respiratory organs are apt to occur during the course of typhoid, as well as in connection with typhus fever; those which are more common in the former than the latter being *pneumonia*, *pleurisy*, and *acute tuberculosis*. Various other complications mentioned under typhus are occasionally met with. Those that are specially to be dreaded in typhoid, however, are *perforation of the intestine* and *peritonitis*. The former generally happens in the third or fourth week, but it may occur as early as the eighth day, or not until the patient is apparently almost convalescent. It is very frequent in the *latent* variety. Usually it is attended with the ordinary symptoms of perforation (to be described hereafter), but sometimes these are very obscure. Peritonitis may be general or local. There may or may not be prominent symptoms of this complication.

The most important *sequelæ* are phlegmasia dolens, phthisis, mental weakness, temporary general or partial paralysis, neuralgia, otorrhœa, anæmia, and a general state of ill-health with much debility and wasting. The last-mentioned condition is due to destruction of the villi and glands of the intestines, accompanied with shrivelling of the mesenteric glands.

Duration and Terminations.—It is often difficult to fix accurately the *duration* of cases of typhoid, on account of its insidious mode of onset. Generally it ranges from three to four weeks, rarely extending beyond the 30th day. Many cases terminate on or about the 21st or 28th day. The mean duration of fatal cases seems to be about 22 days, but many run a much shorter course, and death may occur within the first few days. On the other hand the complaint may be more prolonged, and Murchison mentions an instance in which fresh spots appeared up to the 60th day. *Complications* and *sequelæ* may also protract the disease, as well as a *relapse*, which sometimes happens in about ten days or a fortnight after convalescence has apparently set in.

Typhoid fever may *terminate* in complete recovery; in death; or in a permanent state of ill-health. The average *mortality* is about 1 in 5·4 cases, but it differs in different epidemics. The *causes of death* are:—1. Gradual asthenia, or this condition combined with anæmia. 2. Direct loss of blood, from epistaxis or intestinal hæmorrhage. 3. Poisoning of the blood, as the result of hyperpyrexia, imperfect excretion, or absorption of septic matters. 4. Complications, especially perforation of the bowels or peritonitis.

Prognosis.—Until a patient is quite convalescent after an attack of typhoid, it cannot be considered that all danger is past, and a guarded opinion should always be given as to the ultimate result, even in the mildest cases. The prognosis is rather worse in females; in those advanced in years; and in persons who have come recently to an infected district. Family constitution seems to have some influence. Previous debility does not materially increase the danger.

Many of the conditions mentioned as being unfavourable in typhus, are also unfavourable in typhoid fever, especially severe nervous symptoms and great prostration, but the pulse and tongue are not so much to be relied upon, and abundant eruption is not a bad sign in typhoid. The chief indications of danger are:—severe abdominal symptoms, with excessive diarrhœa; intestinal hæmorrhage, especially if profuse; signs of perforation; symptoms of peritonitis; profuse epistaxis; marked muscular tremors, the mind being clear, which indicates deep ulceration; sudden extreme prostration; aggravation of all the symptoms, after a temporary improvement in the second or third week. A *relapse* rarely proves fatal.

The value of the *thermometer* in guiding the prognosis of typhoid fever requires particular notice. During the second week the temperature shows whether a case is likely to be severe or not. In mild cases a marked morning remission is observed, which begins early and increases; the evening exacerbation is late; and soon there is a permanent fall; in short the stage of defervescence sets in. In severe cases the opposite conditions are observed. The prognosis is unfavourable in proportion to the height of the temperature, and to the duration of this increased heat, especially if there are but slight morning remissions. Either a sudden rise, or a rapid and extreme fall, is a bad sign. Considerable interruption in the ordinary course of the temperature indicates the existence of complications. A marked fall often gives warning of the approach of intestinal hæmorrhage.

TREATMENT.—The remarks made with regard to the *hygienic management* of cases of typhus, apply equally to those of typhoid fever, but there are some points which require special notice. Remembering the origin and chief modes of propagation of the poison of typhoid, every attention must be paid to the *disinfection of the stools*; to the *removal of all filth;* and especially to the *water-supply,* in accordance with the rules already laid down when speaking of the prevention of epidemics.

General management. In all cases a patient suffering from typhoid should take to bed from the first, and remain there until fairly convalescent.

The greatest care is necessary as to *diet,* which should be entirely liquid, nutritious, and non-irritant, and administered at stated intervals, but not too frequently. Good milk is by far the most important article of diet, but beef-tea, which may be thickened with arrowroot, beef-juice, and custards are also serviceable. The patient may drink toast-water, barley-water, or mucilaginous liquids, and may also have tea or coffee frequently. Fruits are not to be permitted. This caution in diet is to be observed in all cases, but especially when there is any reason to suspect extensive ulceration. By proper attention to this matter many cases of enteric fever may be brought safely through, without the administration of any medicine whatever. Much difference of opinion prevails as to the employment of *alcoholic stimulants*. It is certain, however, that their indiscriminate use may do a great deal of harm, and that they are not nearly so much needed as in typhus, or at such an early period. Often they are not at all required, and it is only in the more advanced stages, when the strength has been reduced and the circulation is feeble, that they are usually called for. Their effects must be closely watched.

Therapeutic treatment. *Mineral acids*, and small doses of *quinine*, are the general medicinal remedies most in repute in the treatment of typhoid, but they have not appeared to me nearly so efficacious in this disease as in typhus.

Symptomatic treatment calls for the chief attention in the large majority of cases. The ordinary symptoms associated with fever must be treated as previously described, but a few special remarks are needed with regard to the abdominal symptoms which are so often a source of trouble and anxiety. If there is a tendency to much *pain* or *tympanitis*, it is desirable to apply heat and moisture over the surface of the abdomen, assiduously and from an early period, by means of linseed-meal poultices or fomentations. Occasionally turpentine-stupes or sinapisms are needed in order to give relief, and if the pain is very severe at an early period in young and plethoric patients, it has been recommended to apply three or four leeches over the right iliac fossa, or a small blister. *Opium* or *morphia* internally may also be required for the relief of pain.

Diarrhœa ought to be checked if it is excessive, or if the patient is very weak, but it is by no means always desirable to try to stop it. Enemata of *starch* and *opium* are highly efficacious for keeping diarrhœa within bounds. Internally the best remedies are *Dover's powder*, either alone or with *carbonate of bismuth ; sulphuric acid* with *tincture of opium ;* or *chalk mixture* or *bismuth* combined with *tincture of opium* and *vegetable astringents*. *Acetate of lead*, *sulphate of copper*, or *nitrate of silver* may be needed in obstinate cases.

In those exceptional cases which are attended with constipation, great care must be exercised in the use of aperients. A teaspoonful of *castor oil*, or a *simple enema* every third or fourth day, as recommended by Murchison, answers well under these circumstances.

Excessive *tympanitis* is best relieved by the use of enemata containing *turpentine* or *assafœtida ;* along with the external applications already mentioned. The passage of a long œsophagus-tube into the rectum sometimes gives much relief as regards this symptom.

Intestinal hæmorrhage, if not checked by the remedies mentioned for diarrhœa, demands full doses of *tannic* or *gallic acid*, *turpentine*, or *tincture of iron ;* or hypodermic injection of *ergotine*. Ice may be given to suck constantly, and also applied over the right iliac region.

Should *perforation* or *peritonitis* occur, the treatment must consist of absolute rest ; the total withdrawal of food, or its administration in very small quantities ; and the free use of *opium*. Should constipation ensue, on no account must aperients be given.

Epistaxis sometimes requires the use of local styptics; or it may be necessary to plug the nares.

Convalescence.—During convalescence much careful supervision is needed for some time, especially with regard to food, and the employment of purgatives. The diet must be very gradually improved, and only taken in moderate quantities. It is the more necessary to insist upon this, because patients are often much inclined to indulge to excess in all kinds of food, and do not understand why they should be restricted. Wine is valuable at this time. If an aperient is required, a small dose of *castor oil* or a *simple enema* answers best. *Tonics* and change of air have a very beneficial effect in promoting recovery, and restoring strength. *Cod-liver oil* is also useful.

Special treatment.—It is requisite to notice certain special modes ot treatment which have been advocated for typhoid fever. 1. *Antiseptic treatment.* Various antiseptics have been recommended, especially *carbolic acid* and the *sulpho-carbolates,* mainly on the assumption that the disease depends upon specific organisms, which might be destroyed by the agency of these remedies. There is no adequate proof that these are really useful, and certainly they ought not to be relied upon solely; at the same time there would be no harm in administering harmless antiseptics along with other remedies, as they might have a directly beneficial effect upon the intestinal lesions, and at the same time tend to prevent the formation of septic matters, and consequent blood-poisoning. 2. *Hydropathic treatment.* On the Continent, and particularly in Germany, typhoid fever has been extensively treated by means of baths or the wet-pack. Dr. Gee, in a paper in the *St. Bartholomew's Hospital Reports,* has also spoken in favour of this plan of treatment from a hypothetical point of view. It is often of much service to sponge the skin, and in cases attended with hyperpyrexia more vigorous measures of this kind are indicated, but there is no evidence that a routine hydropathic treatment of typhoid is preferable to other methods, and there are grave objections against its adoption. 3. *Eliminatory treatment.* Some practitioners, instead of endeavouring to check the diarrhœa in typhoid, encourage it by means of aperients, with the view of assisting the elimination of a supposed poison. This plan of treatment is obviously attended with much danger, and in my opinion is most objectionable.

CHAPTER VII.

RELAPSING FEVER.—FAMINE FEVER.

ÆTIOLOGY.—Relapsing fever is an acute specific disease, originating in a *specific poison,* and it is highly infectious. Some suppose that it is identical with typhus fever, being merely a milder form of this malady, but unquestionably they are distinct diseases. Relapsing fever often spreads rapidly, and this happens the more readily where there is freedom of intercourse between the sick and healthy. Dr. de Zouche (*Liverpool Hospital Reports.* Vol. V.) places this malady next to small-pox as regards its degree of contagiousness, and observed that when it gained access into a house it usually attacked every inhabitant therein. The contagium is chiefly contained in the breath and exhalations, and, as in typhus, those who come much into contact with patients are most liable to be attacked. It may be conveyed by individuals or fomites, and clings tenaciously to a house for months. With regard to the nature of the contagium, certain organisms named *spirillæ* have been found in the blood in cases of relapsing fever, during the febrile paroxysms, but they cannot be detected at the time of the crisis, or in the intervals; these have been regarded as the contagium by the advocates of the germ-theory.

Predisposing causes. The anti-hygienic conditions which promote the spread of typhus, have a similar influence in the case of relapsing fever, particularly want of food, over-crowding, and filth, and Murchison believes that the disease may be spontaneously developed, especially as the result of destitution. It prevails generally during periods of famine, and has hence been called famine-fever. This fever is most frequently met with in the British Islands, especially in Ireland. A severe epidemic occurred in Liverpool a few years since. Males are attacked in larger proportion than females; and the complaint is most common between 15 and 25 years of age.

ANATOMICAL CHARACTERS.—There are no *post-mortem* appearances at all characteristic of relapsing fever. Petechiæ and jaundice are persistent if observed during life. The blood frequently contains much urea, and the white corpuscles are increased. Occasionally it is dark and fluid. The spleen is usually much enlarged during the febrile paroxysm, and softened; sometimes it contains fibrinous deposits. The liver is also enlarged and congested, but neither this organ nor its duct exhibits any condition likely to account for the jaundice present. There may be signs of various morbid conditions of the nature of *complications.*

SYMPTOMS.—The *period of incubation* lasts from about four to ten days usually, but may be very much shorter, the attack even appearing to set in almost simultaneously with exposure in exceptional cases.

The *invasion* is remarkably sudden, the patient usually feeling perfectly well immediately before, and being able to fix upon the exact moment of attack. The first symptoms are often felt on awaking in the morning. Generally, however, there has been constipation for some days previously (De Zouche). The attack is commonly ushered in with a severe rigor, and a sense of great weakness, but there may be only slight shivering. Sharp frontal headache is complained of at once or very soon, rapidly increasing in intensity, with giddiness, and pains in the back and limbs, often exceedingly severe. After a variable time marked fever sets in, with dry pungent skin, flushed cheeks, frequent pulse, and excessive thirst. In two or three days profuse and general perspiration follows in some cases, but gives no relief. The rigors are repeated at intervals, and may alternate with sweating, simulating ague. In children the disease may commence with a "heavy sleep." Vomiting and retching are early symptoms, the vomited matters being yellow, yellowish-green, or green, and consisting of bile and gastric secretions; sometimes they are black. Epigastric uneasiness or pain, and pain or tenderness over the liver and spleen, are also complained of, these organs, especially the latter, being obviously enlarged. Appetite is quite lost as a rule, and there is great thirst throughout. The tongue is at first moist and covered with a white or yellowish fur, and generally remains in this condition throughout, but it may become dry and brown, with sordes on the teeth. It is often transversely fissured and red at the edges, with enlarged papillæ. In bad cases patches of ulceration are observed on the tongue and inside of the cheeks. Constipation generally persists throughout, the stools being normal in colour or dark. Sore-throat is frequently complained of, the fauces being reddened, and one or both tonsils being enlarged.

The appearance of the patient is often quite characteristic. "The eyes appear somewhat sunken, from the dark circle which surrounds them; they are clear, but have a despairing woe-begone look, not easily to be forgotten if once seen. The whole face expresses the consciousness of pain and helplessness" (De Zouche). More or less jaundice is observed in many cases, and sometimes the skin exhibits a bronzed hue. Various eruptions have been described as being met with in individual cases, but there is nothing of this nature at all specific in connection with relapsing fever.

The pulse rises rapidly to 100, 120, 140, or even 160. It may be full and strong, but in bad cases tends to be weak, intermittent or irregular, the impulse and sounds of the heart being at the same time feeble. The urine is febrile; it may be much diminished in quantity or suppressed, and urea is often deficient. In exceptional cases the urine contains albumen. Headache continues very severe throughout, with a throbbing sensation, and there is much restlessness and sleeplessness. Delirium is uncommon, but is occasionally observed, especially towards the crisis, when it may be violent in character.

The symptoms become intensified towards the period of the *crisis*, which event happens in most cases on the 5th or 7th day, but it may take place at any time from the 3rd to the 10th day. They are often alarming at this time, and dyspnœa may be prominent. Crisis is almost always accompanied with profuse sweating, the perspiration pouring off for some hours. Sometimes sudamina appear, and occasionally watery diarrhœa or vomiting occurs. Hæmorrhages are not uncommon, especially epistaxis, and occasionally menorrhagia or hæmorrhage from the bowels. In severe cases, and in weak individuals, a copious and general petechial eruption is often observed at this time. The symptoms generally rapidly abate; the pulse and temperature fall even below the normal, the former frequently continuing below par; the tongue cleans; and the patient often feels quite well, only being a little weak. Most patients soon get up, and some try to work.

In exceptional cases there is not a complete cessation of symptoms, but only a partial remission. In other instances severe muscular and arthritic pains are complained of over the body generally, the metacarpal and phalangeal joints being most liable to be attacked. These prevent sleep, and make the patients cry out. At this time the disease may be mistaken for acute rheumatism, especially as some of the joints occasionally become swollen. Bronchitis may set in during the intermission, with much spasmodic cough, and expectoration of viscid tenacious mucus, or even of blood; the symptoms sometimes resemble those of hooping-cough, especially in children.

Relapse.—Occasionally no relapse occurs, especially towards the end of an epidemic, or it is scarcely noticeable. De Zouche states that he was always able to ascertain on close questioning that a relapse had taken place. It may set in any day from the 12th to the 17th, generally on the 14th. Its onset is equally sudden with the primary attack, and the symptoms are precisely the same, their intensity being, however, usually less, though they are in exceptional cases more severe. The average duration of the relapse is from three to five days, but it may vary from a few hours to seven or eight days, and it terminates by crisis, usually in the same manner as the first attack. A second, third, fourth, and even fifth relapse has been sometimes observed.

In rare instances extreme prostration suddenly comes on, with signs of collapse, the face being of a purplish colour, especially the nose, the limbs cold and livid, the pulse very feeble, and the patient becoming unconscious. In other cases typhoid symptoms are developed, accompanied with suppression of urine.

Temperature.—There is a continuous ascent for four or five days without any evident morning remission, the temperature finally reaching 104°, 105°, 106°, or even 108°. It may then remain stationary, with slight morning remissions, until the period of *crisis*, when it falls below the normal. At the *relapse* it again rapidly rises, and may reach even a higher point than during the first attack; it suddenly falls again at the second crisis.

COMPLICATIONS AND SEQUELÆ.—The most important are bronchitis or pneumonia; various hæmorrhages; sudden syncope; pains in the muscles and joints, occasionally with effusion into the latter; a peculiar form of ophthalmia, preceded by amaurosis; diarrhœa or dysentery; œdema of the legs, due to debility and anæmia, which may also cause an anæmic murmur; parotid or other buboes; and abortion. De Zouche observed in many cases fine desquamation of the cuticle about the second week after crisis, and also falling-off of the hair.

TERMINATIONS.—The great majority of cases of relapsing fever recover; in a large number collected by Murchison the mortality was only 4·75 per cent. Convalescence, however, is often tedious, and a state of marked debility may be left, which may ultimately prove fatal. Death may result from syncope, collapse, nervous exhaustion, excessive diarrhœa or dysentery, uterine hæmorrhage, especially after premature labour, uræmia, excessive vomiting in children, pneumonia, peritonitis, or other complications.

Prognosis.—This is generally favourable, but is less so in the old; and in persons lowered by disease, intemperance, or privation.

The chief signs of danger are marked jaundice; severe hæmorrhages, especially uterine; extensive petechiæ or purpuric spots; sordes and ulcerations about the tongue and mouth; incomplete defervescence after the first crisis; suppression or great diminution in the quantity of urine; severe cerebral symptoms; signs of syncope; and the presence of dangerous complications. It must be remembered that serious symptoms may come on quite suddenly, even in a mild case. Convalescence is often considerably delayed, on account of *sequelæ*.

Treatment.—During the first febrile paroxysm it is desirable to keep the bowels regularly open, but not to purge excessively. If the case is seen early, an *emetic* seems to be useful. Attention must be paid to the urine, to see that excretion is properly taking place, and saline *diaphoretics* and *diuretics* may be given. A drink containing ʒ i or ʒ ij of *nitre* to the pint is recommended by Murchison. Cold or tepid sponging is very useful.

Opium is a most valuable remedy to relieve headache, sleeplessness, vomiting, and the severe pains present. De Zouche found *hydrate of chloral* of use. He only considers it desirable to moderate vomiting, should this symptom be excessive. Other symptoms must be attended to if required.

The *diet* should be light though nutritious as a rule, but if the patient is low, a more supporting diet is indicated. *Stimulants* are not often required, but should be given from the first if there is much debility, if an anæmic murmur is present, or if there is any tendency to syncope. They are also called for in the case of old people, and of young infants who cannot take the breast, and are in most cases necessary during the exhaustion following the crisis, as well as during convalescence. *Complications* must be treated as they arise.

During the *interval* the patient should be kept in bed if possible. Various remedies have been tried to prevent the relapse, but without success. *Quinine* in five grain doses may be given. The *relapse* must be treated on the same principles as the primary attack.

During *convalescence* good diet and *tonics*, especially *quinine*, *mineral acids*, and *iron*, are indicated. These also seem to be the best remedies for the various sequelæ. *Leeches* and *blisters* behind the ears, *calomel* internally, and the local use of *atropine* are recommended for the ophthalmia.

CHAPTER VIII.

SCARLATINA—SCARLET FEVER.

ÆTIOLOGY.—Produced by a *specific poison*, scarlatina is highly infectious. This poison is especially abundant in connection with the epithelium which is shed from the skin, by means of which it may be conveyed to a considerable distance. Infection may arise from merely going into the room where a patient is lying ill of scarlatina, or being in the same house, or even in the neighbourhood. The apartment also frequently retains the poison lurking in various parts for an indefinite time, unless it has been thoroughly disinfected, and therefore may be the means of originating the disease after a long interval. The infected epithelium-particles easily cling to clothes, letters, &c., and, by the aid of these and other fomites, are often carried far and wide. They are also sometimes conveyed by milk and other kinds of food. It is important to remember that insusceptible individuals may disseminate scarlatina, if allowed to pass from the sick room and to mingle with healthy persons. The disease has been produced by inoculation. Some believe that it may originate spontaneously, but this is highly improbable. A second attack rarely occurs, and still more exceptionally a third. As to the time the infection lasts in a patient there is no certainty, but it is safer to consider it as beginning with the incubation-period, and not ceasing until desquamation has been thoroughly completed.

Young children are chiefly attacked, from eighteen months to six years of age, but especially those from three to four years old. In addition to the immunity afforded by a previous attack, the liability to scarlatina decidedly diminishes with advancing years. Both sexes are equally affected. The complaint is more prevalent in large towns, and among the poor. Cases are said to be most frequent in autumn, especially from September to November; there are many exceptions to this statement, however, and epidemics are but too common at other times.

ANATOMICAL CHARACTERS.—The changes found after death vary according to the severity of the attack, and the structures involved. The ordinary anatomical characters consist of erythematous inflammation of the skin, with superficial œdema, constituting the scarlatinal rash; more or less inflammation of the fauces; and congestion with catarrh of the tubules of the kidney. Various complications are also frequently met with. The spleen and mesenteric glands are not uncommonly enlarged and hyperæmic. The blood is generally deficient in fibrin and in coagulability; sometimes, on the other hand, fibrin is in excess.

SYMPTOMS.—Scarlatina presents several important and well-marked varieties in its clinical history, but before alluding to these a typical case will first be described.

I. *Incubation stage.*—The *period of incubation* lasts in most cases from three to five days; it may not be longer than one or two days, or it may extend to six or eight days, but not beyond this (Squire). Generally there are no symptoms, but the child is sometimes a little ailing, languid, and restless.

II. *Actual attack.* 1. *Premonitory or Invasion stage.*—The onset is usually distinct. Chilliness is felt, but not severe rigors, followed by pyrexia, varying in its degree, but the temperature generally rises rapidly to 104° or more. The skin feels hot and dry, the face is flushed, and the pulse very frequent. At the same time sore-throat is complained of, the fauces being reddened and dry, while the neck is stiff, and tenderness is felt about the jaws. Vomiting is often a prominent symptom, with much thirst, and total loss of appetite. The tongue is usually furred and red at the tip and edges, presenting also enlarged papillæ. Pains in the limbs, lassitude, frontal headache, and restlessness are generally present. There may be some delirium at night, and in young children scarlatina is sometimes ushered in by sudden convulsions or coma.

2. *Eruptive stage.*—The scarlatinal *rash* generally appears on the second day, but sometimes it comes out within twelve hours, or not until the third or fourth day. Its primary seat ordinarily is the neck and upper part of the chest, but it spreads rapidly to the face, and over the trunk and limbs. Sometimes it appears first on the legs. It begins as minute bright-red points, which speedily coalesce to form uniform patches of greater or less extent, so that large portions of the surface may be covered with the rash. The precise tint varies, but it is usually bright-scarlet, or of a boiled lobster or raspberry hue, though it becomes darker as the case progresses. The colour is more marked in the centre of each spot, and disappears completely on pressure, soon returning again on the removal of pressure, being preceded by a yellowish hue. The patches are usually very distinct in the flexures of the joints. The spots are not at all elevated as a rule, but occasionally separate ones are a little papular. The rash reaches its height usually about the fourth or fifth day from the commencement of the illness, and begins to fade from that to the sixth day, this occurring first in the parts first invaded by it. It has generally disappeared before the ninth or tenth day, and then desquamation sets in.

Sudamina are frequently observed if the rash is intense, especially in adults. They are seen about the neck and chest, in the axillæ or groins, or occasionally over the whole body. The skin feels dry, and often in some parts rough, presenting the condition known as *cutis anserina.* Not unfrequently the eyelids, hands, and feet are puffy. The patient experiences a sensation of heat or burning, and there may be much itching or a sense of tingling.

State of the throat.—There is more or less general redness of the fauces, with œdema and swelling. The surface is dry or covered with viscid mucus, and thick opaque secretion is often seen on the tonsils. These may be slightly ulcerated, or the seat of suppuration. There are the usual subjective symptoms of sore-throat, with pain and difficulty of swallowing. The glands about the angles of the jaw are enlarged and painful, and the subcutaneous tissue is sometimes œdematous and puffy. The mucous membranes of the nose and mouth, as well as the conjunctivæ, are often red and inflamed.

Temperature usually continues to rise until the rash attains its height; then it remains stationary, and subsides as the eruption begins to fade, either by crisis or gradually. It ranges as a rule from 104°—106° F., but may reach 107°, 108°, or even higher in exceptional cases. There is a slight morning remission.

The pulse is frequent, and may reach 120, 130, 160, or more; it varies in its force, but is usually strong and full. It falls as the temperature lowers. The tongue is furred, and presents a "strawberry" appearance, owing to the papillæ being much enlarged and red, projecting through the fur, and the surface may actually feel rough. As it cleans, the tongue is seen to be red, and the papillæ remain prominent sometimes for a considerable period. Appetite is quite lost, but there is much thirst. The bowels are usually constipated. More or less headache continues; while the patient is restless and sleepless, or has some nocturnal delirium.

The urine is febrile, and deposits sediments of uric acid and urates, which, as well as urea, are usually increased. Chloride of sodium and phosphates are diminished in quantity. Albumen is often present, and renal epithelium is visible under the microscope. Sometimes the urine contains blood.

3. *Desquamative stage.*—The symptoms subside more or less rapidly, and then the epidermis begins to separate, this process lasting a very variable period, while the amount of desquamation also differs much, being usually in proportion to the intensity of the rash, and the number of sudamina. The skin feels dry and inelastic before desquamation commences. The process begins as a rule in those parts where the rash first appears. Where the skin is thin, the epidermis comes off in small, branny scales; in other regions it forms small patches; but where the cuticle is very thick, as over the palms and soles, it peels off in extensive patches, sometimes forming a mould of the fingers or hand.

During this period the pulse and temperature frequently fall below the normal for some days. The urine becomes abundant and watery, as well as deficient in phosphoric acid, and it contains a considerable amount of renal and vesical epithelium. The throat may remain sore and the tonsils enlarged for some time.

VARIETIES.—Such being the ordinary course of scarlatina, it is important to point out the chief varieties which may be met with.

1. In some instances the symptoms are very trifling, the temperature not being at any time higher than 101° or 102°, and only a slight rash and sore throat being present, which soon disappear. This is a mild form of *Scarlatina Simplex* or *Benigna.*

2. *Scarlatina Anginosa.*—In this form the condition of the throat is grave, and gives rise to severe and prominent symptoms. There is extensive and deep inflammation of the tissues, the redness tending towards a dark hue, the tonsils and uvula being much swollen, while sticky mucus and secretion cover the surface, or sometimes diphtheritic-looking patches are visible. Ulceration then often sets in, or occasionally gangrene, which may spread extensively, and may

even involve the larynx. The glands about the jaw and the other structures of the neck swell considerably, and may suppurate or slough to a variable extent. In some cases the salivary glands are involved. Much difficulty is experienced in opening the mouth and examining the throat, which is very painful, while swallowing is exceedingly difficult and distressing, and fluids are liable to enter the posterior nares during the act of swallowing. The breath is extremely disagreeable.

The rash is usually delayed in its appearance; is less marked or diffused; disposed to fade and return again; and its final departure is later than usual.

Often there is much swelling of the nasal mucous membrane, with offensive and irritating discharges from the nostrils, or blocking-up of these passages by secretion. The mouth and lips are also sore and cracked; and the tongue has a darker hue than in ordinary cases.

The general symptoms are prone to be of a low type, this being partly due to interference with respiration, and to the absorption of putrid matters from the throat. When adynamia is very marked from the first, the variety is sometimes named *Scarlatina Anginosa Maligna.*

Nausea, vomiting, diarrhœa with irritating discharges, and tympanitis may result from swallowing acrid matters.

If a case terminates in recovery, the temperature continues high after the rash has disappeared, owing to the state of the throat.

3. *Scarlatina Maligna.*—As already stated, the symptoms may take on an exceedingly adynamic or malignant character in connection with a bad state of the throat, and the same thing may happen during any severe attack of scarlatina, especially if the patient has been previously in a weak or unhealthy condition. Nervous symptoms are then prominent from the first. There is much prostration, with restlessness, insomnia, and muttering delirium; followed by convulsions, stupor, or coma. The pulse is very feeble, rapid, small, and irregular; the circulation is impeded, as evidenced by duskiness of the face, and capillary congestion in dependent parts; while petechiæ are frequently observed, and sometimes hæmorrhages occur. Respiration is much hurried. The tongue is dry and brown.

An important class of *malignant* cases are those in which there is extreme prostration from the first, with intense nervous depression, the poison seeming to act powerfully upon the nervous system. The child becomes faint and sick, is pale and cold or almost collapsed, exhibits great restlessness and anxiety, or may be delirious. The pulse is extremely rapid, weak, small, and irregular. The depression speedily increases; the face becomes very pale, livid, or mottled; and coma or convulsions set in. The breathing is quick and irregular. The skin becomes cold, or alternately hot and cold, and clammy perspirations break out. Death may take place before the eruption has time to appear; or a slight irregular rash comes out should the child live long enough.

Several cases of this character are sometimes met with in the same family, its members being rapidly carried off one after another.

4. *Scarlatina sine eruptione.*—In some cases there is fever and a sore throat, but no eruption appears. This is liable to happen in second attacks.

5. *Latent.*—There may be no symptoms whatever, and the fact of a patient having suffered from scarlatina may be known only by desquamation of the cuticle taking place; or albuminuria and dropsy setting in.

In addition to these varieties, others have been described depending upon the characters of the eruption, such as *papulosa, variegata, pustulosa, pemphigoidea,* &c.

COMPLICATIONS AND SEQUELÆ.—1. The most frequent and important *complication*, and the one that requires special notice, is *acute desquamative nephritis* and its consequences. Many authorities, indeed, look upon this morbid condition as *part of the disease.* It is imperative in all cases of scarlatina to examine the urine at frequent intervals, even for some time after apparent convalescence. There is often a certain amount of albuminuria, as in other febrile diseases, and the kidneys are always in a state of congestion and catarrh, but these conditions disappear as the fever subsides. The renal complication generally appears during or after desquamation, and though exposure to cold seems to excite it in some instances, as a rule it comes on quite independently of any such obvious cause. It is due to the deficient action of the skin, which involves excessive activity on the part of the kidneys, these organs having at the same time to remove large quantities of waste products. Probably the scarlatinal poison itself has some influence in destroying the renal epithelium. The symptoms are similar to those of ordinary *acute Bright's disease*, scarlatina being in fact one of the most frequent causes of this affection. The urine becomes diminished or suppressed; is highly concentrated; it contains more or less blood, or has a smoky tint; is highly albuminous; and presents blood-corpuscles, renal epithelium, and epithelial, blood, or granular casts under the microscope. Dropsy sets in, beginning usually in the subcutaneous tissue, and it may spread with great rapidity, involving the serous membranes, larynx, and lungs in some cases. More or less pyrexia is usually present, as well as frequently vomiting, constipation, headache, and drowsiness; while there is always a danger of uræmic symptoms setting in.

The symptoms may subside and disappear; or a form of chronic Bright's disease may remain as a *sequela.* In some instances this complaint seems to commence as a chronic affection.

The remaining *complications* or *sequelæ* calling for notice are:— 2. Dropsy without albuminuria, and having no obvious cause. 3. Ulceration of the throat, either a continuation and extension of that originally present; or a new form, spreading rapidly with much sloughing, and affecting the tissues of the neck widely. Pus may then find its way into the chest; or the vessels of the neck may be opened, causing fatal hæmorrhage. 4. Affections of the joints, either of a rheumatic character; or ordinary inflammation, occasionally ending in suppuration or chronic disease. The inflammation is sometimes around, rather than in the joints, or it may be set up in connection with muscles. 5. Serous inflammations with a tendency to the formation of pus, especially pleurisy and pericarditis, being usually, but not necessarily, dependent upon renal disease or rheumatism. 6. Bronchitis and pneumonia, and possibly phthisis. 7. Endocarditis, which it is highly probable may lead to permanent organic affections of the valves and orifices of the heart. 8. Affections of the ear. These are by no means uncommon, and include otorrhœa; inflammation of the tympanum ending in suppuration, followed by rupture of the tympanic membrane; inflammation or ulceration of the Eustachian tube, with subsequent closure, and consequent deafness; necrosis of the bones, which may cause meningitis, abscess in the brain, or facial paralysis. 9. Abscesses in various parts, especially in connection with lymphatic glands. 10. Gangrene occasionally. 11. Inflammation and destruction of the cornea in rare instances.

Prognosis.—The number of deaths from scarlatina varies greatly at different periods, but the mortality from this disease is considerable every year. A careful prognosis should always be given, and account must be taken of the possible *complications* and *sequelæ*. The complaint is most fatal among very young children; and in large towns. The chief circumstances which render the prognosis grave are a severe epidemic type of the disease; family predisposition to a fatal termination; great depression at an early period; typhoid symptoms at any time; late development of, or a tendency to duskiness in the eruption, especially if accompanied with petechiæ or hæmorrhages; prominent nervous symptoms; extensive sloughing or ulceration about the throat, and other severe complications of this character; renal inflammation and its results; and severe diarrhœa or vomiting. Special allusion must be made to *pregnancy*. The occurrence of scarlatina in connection with this condition is extremely dangerous, and life may be destroyed in a few hours.

Treatment.—In the first place the general treatment for the *prevention of infection* must be thoroughly carried out in every particular in cases of scarlatina, and it is always advisable to keep patients under observation, and to exercise every precaution, until desquamation has entirely ceased, and all chances of the development of renal disease have passed away.

In ordinary cases but little *medicinal treatment* is required. The bowels should be acted upon occasionally, and some saline mixture may be administered, such as a solution of *citrate of potash* or *liquor ammoniæ acetatis*. Barley-water, lemonade, or iced water may be given freely as a drink, and a diet of milk and beef-tea allowed. The skin should be carefully sponged with luke-warm water twice a day, different parts being exposed in succession and then dried; to this water may be added a little *carbolic acid*, *Condy's fluid*, or *camphor*, to act as a disinfectant. Some recommend that oil or grease should be rubbed in. When the fever and rash have subsided, warm baths ought to be used about every other day, and the patient should be well scrubbed with carbolic acid soap, in order to get rid of all the infectious epithelial scales.

Some of the principal conditions which call for active interference will now be considered.

1. The *throat symptoms* are best relieved in ordinary cases by sucking ice or inhaling steam. If there is much redness and swelling, these measures should be steadily persisted in, or the throat may be gargled frequently with luke-warm water, if the patient is old enough to perform this act, heat and moisture being at the same time applied externally over the neck. It may possibly be advisable to apply a few leeches about the angles of the jaw, but very seldom. For ulceration and gangrene *antiseptic* gargles should be freely used, or if these cannot be employed, the application may be made with a brush, or in the form of spray. The best antiseptic remedies are *carbolic acid*, *creosote*, *chlorate of potash*, *Condy's fluid*, or *sulphurous acid;* some prefer *chloride of lime*, *chlorine water*, *dilute hydrochloric acid*, *common salt*, or *peroxide of hydrogen*. It may be requisite to touch ulcers with *nitrate of silver* or its solution.

If the throat is in a serious condition, it is most important to attend to *general treatment*. Nourishing food, in the form of soups, meat extracts, milk, &c., as well as stimulants, especially port wine or brandy, must be given more or less freely in proportion to the state of prostration of the patient, which is often considerable in these cases. At the same time *tincture of steel* should be administered in full doses—♏xx—xl every three or four hours,—alone or combined with *quinine* or *mineral acids*. In some cases *ammonia* and *bark* are preferable. *Carbolic acid* and *sulpho-carbolates*, *creosote*, *hypo-chlorite of soda*, the *hypo-sulphites*, and other antiseptics have been much commended in *scarlatina anginosa*, and there is no harm in giving either of these at the same time as the remedies just indicated. *Chlorate of potash* may be allowed freely as a drink. When the nostrils are blocked up, and there is much nasal secretion and discharge, it is well to wash out the meatuses occasionally with some weak disinfectant solution, or a weak solution of nitrate of silver may be required.

In actual practice it is not uncommonly exceedingly difficult to carry out the instructions just given, especially when we have to deal with young children, who cannot or will not swallow; much must then depend upon the judgment, sagacity, and firmness of the practitioner, but it must be borne in mind that the only hope of recovery in a large number of this class of cases lies in free support of the patient, and, if the necessary materials cannot be introduced into the stomach, they must be administered by enemata.

2. The other conditions which are likely to call for attention are hyperpyrexia; adynamic symptoms; restlessness, sleeplessness, or delirium. These must be treated as in other febrile diseases.

3. *Complications* and *sequelæ* often require special treatment, but here allusion can only be made to the management of the *renal* affection. This should be combatted by free dry-cupping over the

loins, or it may even be advisable to take a little blood from the renal region; the application of hot poultices over the same region, frequently changed; hot-air or vapour baths, in order to excite skin-action; purgation by means of *jalap* and *cream of tartar*; and a plentiful supply of diluent drinks, with a mild saline mixture. When the acute symptoms have subsided, some preparation of *iron* is most valuable, especially the *tincture*; *quinine* is also an useful remedy at this time.

4. For those extremely malignant cases of scarlatina which are attended with early and severe cerebral symptoms, no treatment is of much avail, for they generally prove fatal. The use of a *hot mustard-bath* or *cold water affusion* seems likely to do most good. A blister may be applied to the nape of the neck; and stimulants administered by enemata.

CHAPTER IX.

RUBEOLA—MORBILLI—MEASLES.

ÆTIOLOGY.—Measles is decidedly infectious, especially when the eruption is out, and its contagium passes off abundantly in the exhalations of a patient, the air around being thus contaminated. It is also conveyed by fomites. Children have undoubtedly taken the disease from sleeping in a bed or room previously occupied by a patient suffering from measles. Inoculation has been accomplished through the blood and secretions. A second attack very rarely occurs.

Children are most frequently affected, but those only a few months old often escape during an epidemic, while no age is exempt. Epidemics are more liable to occur during cold and damp seasons.

ANATOMICAL CHARACTERS.—The chief of these is the *specific eruption*, but this often disappears to a great extent after death. It is due to hyperæmia of the skin, with some inflammatory exudation, and in some forms minute extravasations of blood occur. More or less bronchitis invariably sets in, but in fatal cases it is usually extensive and of the capillary variety, being associated with collapse of the lung and lobular pneumonia. Laryngitis is not unfrequently present. The blood is dark and fluid in fatal cases.

SYMPTOMS.—I. *Incubation stage.*—This generally lasts about eight days after exposure to infection. By inoculation measles has been produced in seven days. Out of 50 cases observed by Dr. Squire, 45 had full rash from the tenth to the fourteenth day; in only one case did it appear earlier than this, and in another it was delayed to the eighteenth day. Subtracting four days from these, this will give six to fourteen days as the extremes of the incubation-period. As a rule there are no symptoms during this stage.

II. *Actual attack.*—1. *Premonitory stage.*—Measles usually sets in somewhat acutely, with chilliness, actual rigors, or occasionally convulsions. Then follow the ordinary symptoms of pyrexia, but these are not of great severity in the majority of cases, though the temperature rises rapidly to 101° or 102°, and now and then to 104°. A child attacked with the complaint is languid, irritable, and restless, or may be somewhat delirious at night. The most striking symptoms, however, are those of so-called catarrh or coryza. The eyes are injected and watery, with a feeling of soreness and sandiness, and a dislike for light, the eyelids being also red and tumefied. There is a constant, irritating, watery discharge from the nose, with frequent sneezing, and occasionally epistaxis takes place. A sense of tightness, fulness, or pain is experienced over the frontal sinuses. The throat is generally a little sore and red, and the voice somewhat husky or hoarse, but these symptoms are not prominent. There is more or less laryngeal and tracheal catarrh, as well as bronchial catarrh, which is indicated by a sense of tightness and uneasiness over the chest; frequent cough; quick breathing; and wheezing or dry rhonchal sounds or rhonchal fremitus. A little epigastric pain and tenderness is sometimes complained of, or even general abdominal pains, and there may be much vomiting. The bowels are generally constipated, but may be relaxed.

2. *Eruptive stage.*—The rash makes its appearance in most cases on the fourth day, but may come out from the first to the seventh or eighth day. It begins usually on the face, especially on the forehead, then spreads to the trunk, and lastly to the limbs, appearing in these parts in almost distinct crops on three successive days, but occasionally it is first evident on the limbs. Commencing as small scattered red points, these enlarge to the size of a millet seed or small pea, and become perceptibly raised and papular, eventually being flattened at the summit. They are distinct to the touch, and sometimes have a hard feel.

The eruption tends to form patches of a crescentic, semilunar, or irregularly circular shape. In some cases it is so abundant as to form extensive, irregular though well-defined patches, almost uniformly red, but with elevations upon them; in others it is only sparsely scattered, especially on the limbs, or it may be limited to the face and upper part of the chest. The tint is variously described as rose-coloured, dark raspberry, lilac, and yellowish-red. It is more marked and brighter on exposed parts, such as the hands and face. Pressure removes the colour temporarily, leaving a slight yellowish hue. If the rash is very intense minute vesicles may form, and small petechial extravasations are sometimes observed. It goes on increasing for about twelve hours, and then declines in the same order in which it appeared, the elevations subsiding, and only a reddish or coppery discoloration remaining, the latter continuing for some time. The cuticle desquamates slightly, separating in the form of fine powdery scales, especially on the face, and where the eruption has been considerable; rarely does it come off in patches. Occasionally the eruption suddenly recedes.

During the height of the rash the face and hands are often somewhat puffy and swollen. There is frequently much itchiness and irritability of the skin.

The catarrhal symptoms generally increase during the progress of the eruption to its height. The conjunctivæ and mucous membrane of the nose, mouth, and throat are more or less inflamed, and various discharges escape, or ulceration is occasionally excited. Deafness is now and then noticed, owing to the Eustachian tube being involved. The tongue is much furred, usually moist, and presents a few enlarged and red papillæ; it cleans in patches; sometimes it tends to be dry and brown. Vomiting and diarrhœa may be prominent and persistent symptoms.

The chest-symptoms and physical signs indicate more or less extensive bronchial catarrh, the cough becoming moist, with muco-purulent expectoration; and rhonchal fremitus, with various rhonchal sounds, being perceived on examination.

Temperature increases up to the height of the rash, especially during the later period, there being, according to Dr. E. Fox, a fall before the commencement of the eruptive stage. It does not usually reach above 103°. Morning remissions may be slight, marked, or absent. Defervescence takes place from the fourth to the tenth day, as a rule by a rapid *crisis*, the temperature falling 2°, 3°, 4°, or even 5° in 12 hours. After one or two slight evening exacerbations the temperature becomes normal, or falls even below this point for a few days. In rare instances the temperature rises to 108° or 109°. It must be remembered that it is much influenced by complications.

The urine is febrile, and abundant lithates are deposited on standing; it has a peculiar odour; and not uncommonly there is slight albuminuria, or sometimes blood is passed. The sweat and breath are said to have a peculiar smell.

VARIETIES. The *varieties* of measles are:—1. *Morbilli mitiores, vulgares*, or *simplices*.—This is the ordinary form already described. 2. *Sine eruptione*.—Sometimes there is fever and catarrh, but no eruption appears. 3. *Sine catarrho*.—There may be no catarrh, and occasionally even pyrexia is absent, so that the disease is merely indicated by its eruption. 4. *Graviores, malignant, black*, or *hæmorrhagic*. This form may depend upon the epidemic character of the disease; or upon an unhealthy state of the patient. At first the symptoms may be mild, or they assume a virulent aspect from the outset. The malignant variety of measles is characterized by typhoid symptoms; severe nervous disturbance; and irregularities in the eruption. There is great depression and prostration, with a very weak, frequent, and irregular pulse, cold extremities, a dry and brown tongue, and sordes on the teeth and lips. Twitchings, picking at the bed clothes, convulsions, delirium of a low and muttering character, or stupor, are generally observed at a very early period. The eruption comes out only slightly and irregularly, often receding and reappearing. It is distinctly livid, purple, or black, being mixed with abundant petechiæ, especially about the legs; and sometimes hæmorrhages take place. Extensive bronchitis, pulmonary congestion, or pneumonia is liable to set in. Death usually occurs from asthenia, coma, or asphyxia.

Complications and Sequelæ. These include:—1. Affections of the respiratory organs more especially, which may become dangerous during, or subsequent to, the attack of measles. They comprise acute laryngitis, croupous or diphtheritic; chronic laryngitis; capillary bronchitis; chronic bronchial catarrh; lobular collapse; croupous pneumonia; catarrhal or broncho-pneumonia; acute or chronic phthisis; very rarely gangrene. 2. Acute tuberculosis. 3. Inflammation about the eyes, nose, or ears, tending to become chronic, and being accompanied with discharges. 4. Inflammation of the glands of the neck and other parts, which may remain permanently enlarged. 5. Severe diarrhœa, which may become chronic. 6. Acute Bright's disease rarely. 7. Diphtheritic or gangrenous inflammation of the labia in exceptional instances. 8. A low state of the general health as a sequela.

Prognosis.—As a rule the immediate prognosis of measles is favourable, but the number of deaths varies much in different epidemics. The mortality is greater in elderly persons; in large towns; and during cold and damp seasons. The chief sources of danger are the pulmonary complications. The malignant variety is necessarily exceedingly dangerous, and should recovery take place convalescence is much delayed. Sequelæ are very liable to follow measles, and these must be borne in mind when giving a prognosis.

Treatment.—Decidedly the principal indication in the majority of cases of measles, is to ward off any dangerons complications in connection with the respiratory organs. This is best carried out by keeping the patient in bed, in a room maintained at an uniform temperature of from 60° to 65° F. according to the time of the year, into which steam from a boiling kettle may be admitted. All exposure to draughts must be carefully avoided, until the entire course of the disease has been passed through, and the bronchitic symptoms have subsided. The patient must remain quiet, and it is well to darken the room somewhat. Only a liquid diet should be given, but it need not be too low. The bowels must be kept regularly open by the aid of mild aperients. A mixture containing *liquor ammoniæ acetatis*; *vinum ipecac.*; a few drops of *tinct. camph. co.*, if the cough is very troublesome; with *camphor mixture*, may be administered. If there is much oppression and sense of tightness about the chest, a sinapism or hot poultices or fomentations should be applied. Thirst is to be alleviated by sucking ice, or by means of small quantities of acid drinks. If there is much heat and discomfort about the skin, careful sponging with tepid water may be resorted to, only a limited surface being exposed at the same time.

Should *bronchitis* become extensive, tending to involve the smaller tubes, it is best treated by giving *vinum ipecac.* in good doses; avoiding all opiates; encouraging cough; and applying linseed-meal poultices or sinapisms freely over the chest. Local removal of blood may now and then be indicated in plethoric children. In most of these cases, however, *stimulants* are called for, such as *carbonate of ammonia* and *chloric ether*, with more or less wine or brandy, and plenty of liquid nourishment, administered in small quantities at frequent intervals. If signs of suffocation appear, mustard baths or warm baths with cold douching should be resorted to, as well as artificial respiration. All forms of pneumonia require a stimulant plan of treatment.

Laryngeal symptoms should be treated by the constant application of heat and moisture externally over the larynx; and the assiduous employment of inhalations of steam. Other complications must be attended to should they arise.

Any tendency towards the *typhoid condition* must be combated by the free use of stimulants and nourishing food. If the eruption suddenly recedes, it is recommended to try to bring it out again by means of various baths, and by the administration of warm drinks internally, but this must be done with caution.

During *convalescence* it is necessary to exercise much care for some time; to guard against colds; and, in order to restore the health fully, it is often advisable to give *quinine*, *iron*, and *cod-liver oil*, and to recommend change of air to a suitable climate, as well as cold bathing, especially with salt water. The clothing must be warm, and flannel should be worn next the skin. *Sequelæ* not uncommonly require attention.

CHAPTER X.

RÖTHELN. RUBEOLA NOTHA. GERMAN MEASLES.

It is necessary to consider briefly an affection to which the above names have been applied, the existence of which is by no means sufficiently recognized in this country.

ÆTIOLOGY.—Rötheln has been regarded either as a mild form of measles or scarlatina; or as a combination of these two diseases, and hence termed *hybrid measles* or *hybrid scarlatina*. There is abundant proof, however, that it is quite distinct from both these complaints, though resembling them in many of its features, and that it is undoubtedly an independent *acute specific fever*, propagated by a specific contagium. Dr. Robert Liveing believes that rötheln is far less contagious than either measles or scarlatina, but that it is more distinctly epidemic, at least in this country, even than ordinary measles, and certainly more so than scarlatina. The contagium probably comes off in the breath and cutaneous exhalations. Adults may be attacked as well as children.

SYMPTOMS.—I. *Incubation stage*. This usually lasts about twelve days, but may extend to twenty days. There are no symptoms.

II. *Actual attack.*—1. *Invasion stage*. Rötheln is ushered in with slight shiverings, pains about the body and limbs, and pyrexia, while sore-throat is almost always complained of, which differs from that of scarlatina in being much less severe, very seldom going on to ulceration. In many cases, but not nearly so frequently, signs of catarrh are present, such as are observed in measles. The intensity of the symptoms is generally comparatively mild, and not uncommonly they are quite insignificant, though, on the other hand, they may be rather severe, the temperature running up to 103° or more in some instances.

2. *Eruptive stage.* The eruption, which is in the form of a rash, comes out generally on the second day or even within the first twenty-four hours; it may be delayed, however, until the third or fourth day. Its amount is usually in proportion to the intensity of the early symptoms. It appears more or less simultaneously over the body, but is less marked on the limbs than elsewhere. At first the rash resembles that of measles, consisting of a number of minute red papules which become grouped in patches, but these are more irregular and less distinctly crescentic than those observed in measles. The colour is also rather brighter than in this disease, and it is deeper at the centre than towards the circumference of the patches. In some instances these coalesce either partially or completely, so that the skin is uniformly red over a greater or less extent of surface, and then the rash becomes more like that of scarlatina. The eruption lasts longer than that of either measles or scarlatina, its duration being never less than four or five days, and it may continue for eight or ten days. Slight desquamation of the cuticle follows, but this is never a prominent feature, being merely of a furfuraceous character. When the rash appears, the general symptoms abate considerably in most cases, but the sore-throat persists, being often the last symptom complained of, and continuing sometimes for several days after the rash has disappeared.

Rötheln seems to be unattended by any particular *complications* or *sequelæ* as a rule. Slight albuminuria is not uncommon, but it soon passes away. In rare instances acute renal disease with dropsy sets in.

PROGNOSIS.—This is highly favourable, death from rötheln being an exceedingly rare event, while recovery is usually speedy and complete.

TREATMENT.—All that is needed is to keep the patient in bed; to give a liquid diet; and to administer an aperient if necessary, with some simple saline mixture. Should the throat be very sore, it may be gargled with milk and warm water.

CHAPTER XI.

VARIOLA—SMALL POX.

ÆTIOLOGY.—The *specific poison* which generates small-pox is very easily conveyed from one individual to another by inoculation, contact, and infection. It exists in the blood, in the contents of the eruption, and in the substance of the dried scabs, being also given off abundantly in the various secretions, excretions, and exhalations, especially in those emanating from the lungs and skin. Inoculation can be accomplished through the blood, as well as most effectually through the serum, pus, or dried scabs of the eruption. Small-pox is one of the most infectious diseases, and its contagium can be conveyed to considerable distances. It is exceedingly dangerous to be in the vicinity of a patient suffering from this disease even in its mildest form, as this may induce the most virulent type. The poison clings tenaciously to fomites, especially to clothes and other articles of a rough texture, and retains its vitality for a long period; therefore it is highly dangerous to go into a room which has been occupied by a small-pox patient until this has been most thoroughly disinfected, while clothing and other articles will certainly propagate the disease unless treated in the same manner. There can be no doubt but that the disease has been not uncommonly propagated by cabs. I have known several instances in which persons suffering from mild variola have come as out-patients to hospitals, and as they may remain for some time among the other patients, it is not at all improbable that the affection is sometimes disseminated in this way.

Experiments have been made by Burdon-Sanderson and others, in order to try to discover the exact nature of the contagium of small-pox, and it has been supposed to consist in certain minute particles which are present in the contents of the eruption. Klein has described peculiar organisms in connection with sheep-pox, which is identical with small-pox, but the observations of Dr. Creighton throw much doubt upon their existence.

The safer conclusion as regards the time during which infection lasts, is to consider it as beginning with the earliest appearance of symptoms, and continuing for some time after the eruption has disappeared. The danger is greatest during the period of suppuration. It is very important to bear in mind that the bodies of those who have died from small-pox may undoubtedly convey infection. A second attack is only rarely met with, but even a third may occur.

Variola may be met with at any age. It attacks most commonly and most severely those who have either not been vaccinated or re-vaccinated at all, or only inefficiently. Constitution and race seem to influence the occurrence and characters of the disease. Some individuals resist all infection, and cannot even be inoculated. The negro and dark races generally suffer severely. Dread of infection is said to act as a predisposing cause. The lower classes suffer most, for obvious reasons.

Anatomical Characters.—The eruption of small-pox is the result of circumscribed inflammation of the skin, extending more or less deeply. There is first congestion, which some believe begins in the follicles of the skin. Then the papillæ enlarge, and the cells of the rete mucosum increase, this giving rise to papules. A layer of soft whitish exudation is described as forming between the cuticle and the true skin, due to proliferation of the cells of the rete mucosum. Next a clear fluid collects beneath the superficial layer of the epidermis, a vesicle being thus formed, and subsequently pus is produced. The pustules either rupture or dry up. The true skin may be extensively involved and destroyed. Mucous surfaces are not uncommonly affected, especially the conjunctiva and the mucous membranes of the mouth, throat, and nose. Occasionally the whole extent of the respiratory or alimentary mucous tract is involved. There may be merely inflammation, or it is said the specific eruption is sometimes observed. Other mucous surfaces are also implicated, and the eruption has been described as occurring even on serous surfaces. Various organs are often inflamed, as well as serous membranes, especially the pleuræ, and the exudations are liable to be of a low type, or of a sanguineous nature. The heart, kidneys, liver, and muscles generally are soft, being the seat of acute fatty degeneration. Putrefaction proceeds rapidly after death.

SYMPTOMS.—I. *Incubation stage.*—After inoculation of the small-pox virus, the first symptoms appear in seven days. When communicated by infection, the incubation-period is almost always twelve days, but it may be a day or two longer or shorter. During this period there may be some feeling of general illness, but no definite symptoms are noticed.

II. *Actual attack.*—1. *Premonitory or Invasion stage.*—Small-pox usually commences suddenly, with chills or repeated and well-marked rigors, followed by pyrexial symptoms, constituting the *primary fever.* The temperature rises rapidly, and may reach 104° or 106° before the eruption appears. Along with the usual symptoms of fever, which are generally severe, there are others of a very significant character, viz., a feeling of marked uneasiness and fulness or actual pain in the epigastrium, with nausea and more or less obstinate vomiting; pains over the body generally, but especially in the middle of the back, opposite the lower dorsal, lumbar, and sacral regions, this pain not being aggravated by movement; and considerable debility and sense of illness, with tremulousness of the muscles. Even in mild cases it is often remarkable how prominent these symptoms are. Much headache is usually complained of, while the face is flushed, and the carotids throb. In some cases the disease sets in with violent nervous symptoms, such as restlessness, delirium, somnolence, stupor, coma, or convulsions, the last being particularly frequent in children. Occasionally there is considerable sore-throat or coryza. The severity of the symptoms at this period is generally in proportion to that of the subsequent stages.

2. *Eruptive stage.*—The eruption appears usually during the third day, but may be delayed until the beginning of the fourth. The face is almost invariably its primary seat, especially the forehead, but in rare cases it commences about the wrists. It spreads over the body and limbs in from one to two days, and is described as forming three successive crops. The number of spots or "pocks" varies from just a few to thousands, but as a rule from 100 to 300 are present. On the face they are more abundant than elsewhere. They may be distinct, or they run together in different ways, thus giving rise to certain varieties which will presently be alluded to.

Characters.—If a typical individual pock be observed, it will be found to pass through the following course. It starts as a minute bright-red spot, a little raised; enlarging and becoming more elevated, it forms a distinct papule on the second or third day, well-defined, flattened at the top, and having a peculiar solid, hard, dense feel, compared to that of a shot or mustard-seed under the skin, which is very characteristic. This soon changes into a vesicle, a little clear thin fluid collecting in the centre, under the epidermis. About the fifth day a depression forms on the top of the pock, which thus becomes umbilicated; at the same time the contents gradually assume a purulent character, this change beginning at the circumference, the central part still for some time remaining vesicular, and this vesicular portion is stated to be distinctly separated from the surrounding pus by a transverse partition, so that the two spaces may be severally emptied of their contents. The pus is formed by softening and liquefaction of a white substance, originating in an increased growth of the cells of the rete mucosum, which finally become pus-cells. At this time a distinct ring of inflammatory redness appears around each pock. The pus increases in quantity, and after a while the umbilication disappears, the pock becoming either rounded or pointed at the top. Its interior is divided into a variable number of areolæ or compartments, sometimes regularly arranged and of equal size, but usually irregular and unequal, the partitions being formed by the white substance already mentioned. With regard to the cause of the umbilication, it has been attributed to the passage of a gland-duct or hair-follicle through the pock; or to a central organic connection between the epidermis and cutis, which finally gives way.

About the eighth day the pustule is at its height, having arrived at the end of the stage of *maturation*. Then it undergoes retrograde changes. It either ruptures, its contents being discharged and drying up, so as to form a yellowish-brown scab; or it shrivels and dries up without rupturing. The scab separates from the eleventh to the fourteenth day, leaving a stain of a reddish-brown colour, which remains for a variable period. If the cutis is at all destroyed, a pit is left of greater or less depth, which ultimately becomes of a dead-white colour.

The course of the eruption just described is modified by circumstances which will be alluded to presently. It is generally completed on the face before other parts of the body.

The appearances and symptoms associated with the eruption will vary according to its amount. If it is at all considerable, there is tumefaction and puffiness of the scalp, face, neck, and other parts, accompanied with a sensation of throbbing and tightness. The eyelids may be so swollen as to be completely closed. The skin is generally of a deep-red colour between the pocks, and feels more or less sore and tender. There is almost always most uncomfortable itching, which induces patients to scratch themselves, thus causing much soreness and ultimate disfigurement. A characteristic, unpleasant, sickly odour is exhaled from the body.

The eruption not unfrequently involves the mucous membrane of the mouth and throat, this being accompanied with soreness, salivation, and dysphagia. There is a discharge from the nostrils, or these passages are blocked up. Sometimes the larynx, trachea, and bronchi are involved, as indicated by hoarseness, cough, and more or less dyspnœa. The urino-genital mucous membrane is often affected, causing much pain and soreness, with dysuria, and sometimes hæmaturia. It is said that the eruption may even be met with in the rectum, or along the whole course of the alimentary canal, but this is a doubtful statement. Diarrhœa is not an uncommon symptom.

The conjunctiva is frequently in an irritable and inflamed condition, and hence a burning sensation is experienced about the eyelids, accompanied with inability to bear the light, and increased secretion of tears. Occasionally a pustule forms on the ocular conjunctiva, which may lead to ulceration and destruction of the cornea.

Secondary fever.—When the eruption of small-pox appears. the primary fever abates rapidly, so that the temperature falls nearly or quite to the normal in moderate cases, the patient feeling as if convalescent. When suppuration commences, however, *secondary* or *symptomatic fever* sets in, depending upon and being in proportion to the inflammation of the skin, and subsiding as this subsides. It often begins with rigors or chills. The pulse becomes frequent, and there is much thirst, with dryness of the tongue and mouth. The *temperature* rises to 104° or 105° F. in a typical case, reaching its maximum when suppuration is at its height, but it may be considerably above this. *Defervescence* is gradual, and there may be another elevation of temperature when desiccation occurs.

The urine is febrile so long as the pyrexial condition lasts; sometimes it contains a little albumen; or in cases of a low type more or less blood may be mixed with it.

VARIETIES.—1. *Discrete.*—In this variety the pocks are distinct, and do not run into each other, though some of them may touch. They are never numerous, and there may be but a few scattered about here and there. The symptoms are usually mild, but their severity depends upon the amount of the eruption.

2. *Confluent.*—This is a very serious form, in which the eruption is abundant, and the pustules run into each other. The symptoms of the *invasion stage* are severe, and nervous symptoms are often prominent. The *eruptive stage* commences earlier, and there is not at this time such a distinct remission in the fever as is observed in ordinary cases. The eruption is often preceded by erysipelas or erythema. Very numerous papules appear, small and but slightly prominent, arranged in groups or irregularly, and they rapidly spread over the whole body. The course of the eruption is more rapid than usual, the vesicular and pustular stages being soon reached. The pustules present variable appearances, but they are often extensive and flat, and there may be large bullæ filled with pus. The face is sometimes "as if covered with one bladder of matter." The contents are in some cases serous and watery, or bloody, and very offensive. Frequently there is no dis-

tinct red areola around each pustule, but the skin generally is of a dark-red colour. Extensive crusts form after desiccation, often of a dark colour and soft, which do not separate for some time. Confluence is usually most evident and most serious about the scalp, face, and neck; the face may ultimately be covered with a continuous crust, like a mask. The true skin is destroyed more or less, and extensive pits, scars, or seams are left, which tend to contract, thus causing great disfigurement. The eruption is generally abundant on the mucous surfaces, giving rise to the various symptoms already mentioned.

Secondary fever does not stand out so distinctly in the confluent as in the discrete variety of small-pox, and adynamic symptoms are apt to set in, with intense nervous depression. *Complications* and *sequelæ* are also very liable to arise, many of them of a serious and dangerous character. This form is exceedingly fatal, and if recovery takes place convalescence is generally very slow. Occasionally, however, cases of confluent small-pox are met with which run a remarkably favourable course.

3. *Semi-confluent* or *Coherent.*—This is an intermediate variety, in which the pocks are not quite distinct, but do not actually run into each other. It is not a dangerous form.

4. *Corymbose.*—Here the eruption is arranged in clusters like bunches of grapes, and it exhibits a tendency to symmetry. It is said to be a very dangerous and fatal variety.

5. *Malignant.*—Under this term several forms of small-pox which are occasionally observed may be included. In some instances an individual is attacked with severe primary fever attended with low symptoms, and dies from the intensity of the action of the poison before the eruption can appear. Other varieties of malignant small-pox are named *black* or *hæmorrhagic; petechial; ulcerative;* and *gangrenous;* these terms sufficiently indicating their nature.

In the *hæmorrhagic* form there is intense adynamia and nervous prostration from the first, with delirium, great restlessness, somnolence, or a tendency to coma. The face is sunken and anxious, and the breathing hurried. The eruption is slow and irregular in its development, sometimes receding; it tends to be livid or black, and if pustules are formed, they contain blood. Petechiæ are observed also between the pocks, and hæmorrhage takes place from various parts.

6. *Benigna—Verrucosa—Cornea—Horn-pock* or *Wart-pock.*—This is a mild and abortive form, in which the pocks do not become purulent, but shrivel and dry up on the fifth or sixth day. There is no secondary fever, and the duration is shorter than usual. It generally follows vaccination. Another mild variety is that in which the eruption continues vesicular to the end—*crystalline-pock.*

7. *Variola sine eruptione.*—It is believed that in persons well protected, there may be primary fever without the subsequent appearance of any eruption.

8. *Anomalæ.*—This term is applied to variola occurring along with other exanthemata, during pregnancy, in the fœtus, &c., and thus presenting irregularities.

There are two modifications of small-pox which call for special notice.

INOCULATED SMALL-POX.—When the poison of variola is directly introduced by inoculation, the course of events is usually as follows:—On the second day a slight discoloration is observed at the seat of inoculation, and on the fourth or fifth day this is somewhat inflamed and irritable, a small vesicle forming, which enlarges, and becomes surrounded by an inflamed areola about the seventh day. From this time to the ninth day the ordinary primary fever sets in, and in three or four days more the general eruption appears, the original vesicle having in the meantime become pustular and being now at its height, after which it undergoes retrograde changes. The important fact in connection with the inoculated disease is, that in its entire course it tends to be exceedingly mild, the number of pustules being very limited. Occasionally, however, when thus originated it assumes a serious or even fatal form.

SMALL-POX AFTER VACCINATION—VARIOLOID—VARICELLOID.—There can be no question as to the fact of variola being prevented or greatly modified by efficient vaccination or re-vaccination. The principal effects of vaccination may be thus stated:—1. It sometimes prevents any eruption, there being merely a slight primary fever for three or four days. 2. It diminishes the number of pocks. In some instances there is marked fever, which ushers in a slight eruption, it may be but a single pock. 3. It modifies and shortens the course of the eruption, and thus diminishes considerably the secondary fever and its accompanying dangers, as well as the destructive effects on the skin with consequent disfigurement. In some instances the eruption, even if extensive, does not go beyond the papular or vesicular stage; in others, though it becomes pustular, its course is more rapid, the pustules drying up on the sixth or seventh day. Generally they are small and do not present umbilication. The unpleasant odour is usually absent. In some cases the eruption is preceded by an erythematous or roseolar rash, and it may appear first on the trunk. As the result of desiccation, flat, thin crusts are formed; or hard shining scales; or occasionally little tubercles. There is either no pitting at all, or this is very slight.

COMPLICATIONS AND SEQUELÆ.—These are very frequent, especially in connection with the more severe forms of small-pox, the more important being.—1. Affections of the respiratory organs, viz., low forms of pneumonia; pleurisy, rapid in its progress and very dangerous; bronchitis, or inflammation of the general respiratory tract, with the formation of much thick purulent material; occasionally œdema glottidis. 2. Affections of the alimentary canal, such as severe glossitis, gastritis, enteritis, profuse diarrhœa. 3. Various local inflammations and abscesses, viz., over parts that are pressed upon; in the subcutaneous cellular tissue; or in the deep structures of the limbs; along with which may be included boils, which often come out in large numbers, and carbuncles. *The pus* is generally very unhealthy and sanious. 4. Gangrene of certain parts, such as the scrotum or labia. 5. Erysipelas, especially of the head and face; ecthyma, rupia, or eczema. 6. Pyæmia or septicæmia, from absorption of septic materials. 7. Affections of the organs of sense, which are not uncommonly very destructive, especially ophthalmia; ulceration of the cornea; otitis with purulent discharge, ending in caries of the bones; and destructive inflammation of the nose. 8. Urinary complications, viz., cystitis; retention and subsequent incontinence of urine; renal congestion with albuminuria and casts; or abscess of the kidney. 9. Inflammation of the ovaries or testicles. 10. Various hæmorrhages, especially hæmaturia, menorrhagia, hæmoptysis, and epistaxis, accompanied with petechiæ. 11. Peritonitis in exceptional cases.

Prognosis.—Small-pox is a very grave disease, the proportion of deaths being exceedingly high, averaging about 1 in 3 cases. Death may take place at any period of its course, but occurs most frequently between the eighth and thirteenth days, and especially on the eleventh. The usual causes of death are high fever; adynamia; apnœa; pyæmia or septicæmia; direct loss of blood; or, at a later period, asthenia.

The chief circumstances which influence the prognosis are:—1. *Age*. Small-pox is very fatal in children under five years of age; and in persons who have passed middle life. From 10 to 15 is the most favourable period as regards prognosis. 2. The *hygienic conditions* surrounding the patient, the prognosis being worse if these are unfavourable. 3. The *previous habits* and *health* of the patient, intemperance, debility from any cause, or any organic disease being injurious. 4. Whether *satisfactory vaccination* has been accomplished or not. 5. The *nature* and *intensity* of the symptoms. Among the signs of evil import are recognized a very high temperature; persistent and excessive lumbar pain; severe vomiting after the appearance of the eruption; as well as all symptoms of an adynamic or malignant character, with nervous depression. 6. The *amount* and *characters* of the *eruption*. The gravity of a case is in proportion to the confluence of the eruption, and to the rapidity of its extension. The corymbose variety is very fatal. Other dangerous signs in connection with the eruption are imperfect development of the pustules, or their sudden subsidence; lividity, hæmorrhage, or gangrene in connection with them; the presence of petechiæ; pallor with absence of swelling between the pustules. 7. The *complications* present. These materially influence the prognosis, especially those referable to the respiratory and nervous systems. Hæmorrhages are also of very serious import. Convalescence is often much delayed by complications and sequelæ. Pregnancy is a peculiarly dangerous condition if associated with small-pox. Abortion usually results, and the termination of the case is generally fatal. In some instances the eruption is observed over the fœtus. 8. *Epidemic constitution*. Some epidemics are comparatively mild, others very grave.

Treatment.—The indications for the treatment of small-pox may be laid down as follows:—1. To pay strict attention to all hygienic conditions, as well as to diet. 2. To prevent a copious eruption, and endeavour to cause this to pass through its different stages as mildly as possible, checking extensive suppuration and destruction of the skin, especially about the face. 3. To subdue excessive pyrexia. 4. To sustain the strength of the patient during the process of suppuration. 5. To treat symptoms, which are often distressing. 6. To guard as much as possible against all complications, and treat them as they arise.

1. Even in the mildest cases patients suffering from small-pox should be strictly confined to their rooms. *Free ventilation* is essential, and the apartment should be large and moderately cool, all carpets and curtains being removed, as well as excessive bedclothes, due care being taken to protect the patient against unnecessary draughts. *Cleanliness* is also most important, the linen being frequently changed, and at once subjected to the action of some disinfecting agent. In the early period a low diet is called for as a rule, with plenty of cooling drinks or ice, as well as fruits, especially roasted apples, while stimulants must be avoided. Later on it is generally necessary to alter the diet gradually, and to have recourse to beef-tea, soups, jellies, &c., as well as to stimulants, the nature and quantity of these being regulated by the circumstances of each individual case. In all cases of a low type, and especially when there is much suppuration, considerable support is needed in the way of nutritious food and stimulants, and if there are indications that the patient will have to struggle through a long process of suppuration, it is important not to allow the strength to become much reduced, but to employ supporting measures carefully from the first.

2. The management of the *eruption* has always naturally attracted considerable attention. At one time it was the custom to keep patients suffering from small-pox very warm, and to give them hot drinks, with the view of "bringing out the eruption," but at the present day the object aimed at is to limit this as much as possible, and to modify its course, so as to prevent the dangers of excessive suppuration, and the subsequent pitting and disfigurement. The skin must be sponged freely with luke-warm water, to which may be added some *antiseptic*, such as *carbolic acid*, *Condy's fluid*, *chlorine water*, or *sulphurous acid.* It has been recommended to apply *carbolic acid* and *oil* freely over the surface, but this proceeding is of questionable propriety. Some consider that the eruption is best checked by keeping the patient in a dark room; others advocate puncturing each pock as soon as pus forms. Many *local applications* have been made use of in order to prevent pitting, the chief of which are *nitrate of silver*, either applied in the solid form to each pustule, or brushed over the surface as a solution; *mercurial plaster* or *ointment; solution of corrosive sublimate* (gr. ij ad ℥ vi); *sulphur ointment; tincture of iodine; gutta percha* dissolved in *chloroform;* and *carbolic acid*, alone or mixed with glycerine. Most of these are very irritating, and require much care in their employment. Dr. Sansom advocates *touching each* pustule with *carbolic acid*, and then applying a mixture

of this substance with *oil of thyme*. All the pustules should not be touched at one time, but they should be attacked on successive occasions. Mr. Marson recommends waiting until the pustules have discharged their contents, and then applying either *olive oil*, alone or mixed with *lime-water* or *calamine*; a mixture of *glycerine* and *rose water*; or *cold cream* and *oxide of zinc*. He warns against allowing the scabs to dry, and to remain for some time on the nose and other parts of the face. Of course the patient must be prevented as much as possible from scratching. The irritation excited by the acrid secretions is best relieved by frequent sponging, and by the free use of some absorbent powder, such as flour, starch, hair-powder, or calamine. If there is much eruption on the scalp, it is necessary at an early period to cut the hair very short, or even to shave the head.

3. In most cases *pyrexia* can be kept within limits by sponging the skin, and by the administration of cooling drinks, with a *diaphoretic saline* mixture. A brisk *purgative* is advisable at the outset, and the bowels should be kept freely open afterwards. If there is a tendency to hyperpyrexia, full doses of *quinine* (gr. iii—v. every three or four hours) seem to answer best in this disease. Venesection is never called for.

4. During the *suppurative stage* tonics are needed, such as *quinine, iron*, or *mineral acids* with *decoction of bark*. If there are adynamic symptoms, these remedies must be given freely, along with *ammonia, camphor*, and other *diffusible stimulants;* as well as with plenty of nourishing food, and wine or brandy.

5. The chief *symptoms* which may require to be treated are vomiting or diarrhœa; restlessness, sleeplessness, or delirium; soreness of the throat; and hæmorrhages. It is recommended to give *morphia* for one or two nights, in order to get the patient into the habit of sleeping. Caution must be exercised in the administration of narcotics, should there be much bronchial catarrh or salivation. Delirium in small-pox is frequently an indication for the free use of stimulants. Physical restraint may be required, and benefit is sometimes derived from the use of the warm bath. Sore throat is best relieved by the use of some mild gargle, or by sucking ice frequently, or taking a little currant jelly. Hæmorrhages call for the administration of full doses of *tincture of steel, tannic* or *gallic acid, turpentine*, or *ergot of rye*, some of which may be given in combination. Retention or suppression of urine is said to occur sometimes, but in the Small-pox Hospital this symptom has never been found to give any trouble. The catheter must be employed should the urine be retained.

6. The *complications* which it is specially necessary to guard against and to be on the look-out for, are those connected with the respiratory organs and eyes, and various abscesses. Inflammations usually call for a stimulating plan of treatment, and rarely is any removal of blood required; occasionally it may be advisable to apply a few leeches. If there is bronchitis, the patient must be encouraged to cough frequently. All abscesses should be speedily

opened. Should there be any purulent discharge, particular attention is required as regards cleanliness.

In order to prevent complications connected with the eyes, it is recommended to apply cold water constantly; or to use compresses of a weak solution of *corrosive sublimate* (gr. i ad ℥ vi). Should either of these complications arise, a supporting treatment is indicated. A blister over the temple often does good if there is much conjunctivitis. Marson recommends the use of *poppy-fomentations* with *alum*. It may be necessary to touch an ulcer of the cornea with a pointed stick or solution of *nitrate of silver*. A green shade should be worn.

Numerous *special methods* for the treatment of small-pox have been brought forward, but the only one that deserves notice is the treatment by *antiseptics*. On the whole the balance of opinion seems to be in favour of the internal administration of these remedies, but some have not found them so valuable as others, and there is decidedly no unanimity of opinion as to which antiseptic it is best to employ. Different observers advocate the administration of *carbolic acid*, *sulpho-carbolates*, *sulphurous acid*, *sulphites*, or *hypochlorites*. At the same time *tonics*, such as *quinine* or *iron*, may be given.

During *convalescence* good diet and *tonics* are required, and *cod-liver oil* is often very useful. As soon as the patient is in a fit condition, warm baths should be employed, carbolic soap being freely used.

Preventive treatment.—The rules for preventing the spread of contagious diseases should be rigidly carried out in the case of small-pox. Patients who have suffered from this disease must not be allowed to mingle with healthy persons until they are quite convalescent, and have been completely disinfected. Rooms which have been occupied by such patients, as well as clothing worn by them, must also be thoroughly cleansed and disinfected. Any articles used for cleansing the skin, such as pieces of sponge or rags, should be immediately destroyed. The great prophylactic against small-pox, however, is *satisfactory vaccination* and *re-vaccination*, as will be pointed out in the next chapter. *Inoculation with variolous virus* has been practised, with the view of producing a mild type of the disease, but this is only justifiable under certain rare circumstances, namely, when small-pox breaks out among a number of people in a confined space, and no vaccine-matter can be obtained, *e.g.*, on board ship out at sea.

CHAPTER XII.

VACCINIA—COW-POX.*

ÆTIOLOGY.—Vaccinia is an acute specific disease, originating from a *specific virus*. In the cow, especially the milch cow, it occurs as a natural malady, either sporadic or epizootic, running a definite course, and attended with the formation of a vesicular eruption near the udder and on the body of the teats. In the human being it is only induced by direct inoculation, either of the matter taken from the cow, or of that conveyed from one individual to another. Many believe that vaccinia is identical in its nature with variola, only modified by its occurrence in another animal, and there have been many observations and experiments which seem to support this notion.

METHODS OF VACCINATION, AND PRECAUTIONS TO BE OBSERVED.—The great majority of practitioners vaccinate with lymph taken from the human being, but some advocate that it should be obtained immediately from the cow. There seems to be positive proof that the lymph does not deteriorate or lose its protective power after passing through any number of individuals. The matter should, if possible, be inoculated when fresh, being inserted directly from arm to arm. Often, however, this is not practicable, and the lymph has to be collected in glass tubes, on ivory points, or on little plates of glass, and used subsequently. It has been recommended to mix the lymph in a watch glass with twice its quantity of pure glycerine and water, and to preserve this mixture in capillary tubes, which is said to be equally effective. The matter should always be taken from a perfectly healthy child; from thoroughly characteristic vesicles; on the eighth day. Several punctures are to be made on the summit of each vesicle, so that no blood shall be mixed with the lymph, and all pressure must be avoided, only such fluid as escapes spontaneously being made use of. If dried lymph is employed for vaccinating, it must be rendered liquid by mixing it with a very minute quantity of water.

Vaccination ought to be performed when children are very young, *i.e.*, from six weeks to three months old, provided other circumstances are favourable. It is most important that they should be in good health at the time, and especially that they are free from skin-affections and acute disorders, such as diarrhœa. If small-pox is in the neighbourhood, however, vaccination should be performed under any circumstances, and at the earliest age, even immediately after birth should there be great risk of infection. If children are weakly, and there is no urgency, vaccination may be delayed for a year or two. Of course no subject is too old to be vaccinated, if the operation has not previously been satisfactorily done. When vaccination proves unsuccessful, it should be repeated after a short interval.

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* Those who are specially interested in Vaccination, will find most useful and practical information in the admirable REPORT embodying the statistics of Vaccination, prepared by Mr. John Prior Purvis of Greenwich for the Greenwich Board of Guardians, and recently published.

The part selected for inoculation is the outside of the arm, over the insertion of the deltoid muscle, the skin of this region being made tense. The chief methods of performing the operation, which should be always carried out thoroughly and carefully, are as follows:—1. By a single or double puncture with a sharp lancet well charged with the lymph, this being introduced obliquely under the cuticle into the cutis, so as to make a valvular aperture; the instrument should be left in for a few seconds, and as it is removed the seat of puncture must be compressed. Several special instruments have been invented for this operation. 2. By making a number of minute superficial punctures, or "tattooing" as it is termed, and then applying the lymph with the flat surface of the lancet. 3. By first rubbing in the lymph, then tearing up the cuticle with the lancet over a surface equal to about the area of a sixpenny piece, and finally rubbing in more lymph. Two such patches are sufficient. 4. By scratching the cuticle, and thus producing superficial scarification, the lymph being then applied. Some employ single long scratches, distant half an inch to an inch from each other; the best plan, however, is to make a number of fine parallel scratches over a small area, and others may be made across these. Scarifiers have been invented for this purpose, but the ordinary lancet answers very well. 5. By abrasion of the cuticle with the edge of the lancet, which is used as an eraser is employed to remove blots from paper. 6. By vesication, liquor ammoniæ being applied, and then the cuticle rubbed off, and the vaccine matter applied.

When the surface over which vaccination is performed is small, as in the case of puncture or limited scarification, it is necessary to inoculate in at least five points in the same arm at distances of about half an inch apart, or in three places on each arm.

Revived lymph may either be inserted directly by means of the lancet: or, if it is on ivory points, these may be introduced into punctures, or rubbed on scarified surfaces.

Phenomena following Vaccination.—At the end of the second or beginning of the third day, little papular elevations are visible over the points of inoculation, with slight redness around. The elevation and redness increase, and by the fifth or sixth day distinct vesicles form. These are round or oval, bluish-white, raised at the margin, and depressed in the centre. At the close of the seventh or beginning of the eighth day, a circular inflamed areola forms around each vesicle. The latter continues to enlarge during the eighth day, when it is in its most perfect state, being full, tense, rounded and much raised at the margin, and presenting a pearly colour and lustre, with translucency. The contents appear clear and slightly viscid, but minute active particles are visible under high powers of the microscope, which are supposed by Dr. Beale to be particles of bioplasm to which the lymph owes its active properties.

The areola continues to extend for a couple of days, reaching a diameter of from one to three inches, and being accompanied with more or less induration and swelling; sometimes small vesicles form upon it. On the tenth or eleventh day it begins to fade, and at the same time the contents of the vesicle become opaque, while it gradually dries up and becomes brown in the centre, by the fourteenth or fifteenth day a hard reddish-brown scab being formed. This darkens in colour, shrivel, and falls off from the twenty-first to the twenty-fifth day, leaving a permanent scar. A typical cicatrix ought to be circular, white, not less than one-third of an inch in diameter, depressed, with minute pits or foveolæ over its base. Sometimes radiations from the centre are observed.

The appearances and course above described may be modified by certain obvious circumstances, or without any evident cause. After some of the methods of vaccination the vesicles are compound or in crops. In adults they do not usually present thoroughly typical characters, on account of the structure of the skin, while their course is often retarded, and the areola is more diffused. Retardation or acceleration of the course is sometimes observed without any obvious cause. In some cases an entirely irregular and spurious form of eruption is met with. This irregularity is generally due either to improper lymph having been used, to the child being in an unhealthy condition, or to mechanical irritation at the seat of inoculation; but occasionally it cannot be thus explained.

Many irregularities are observed when the lymph is taken immediately from the cow. "Papulation is deferred till the seventh, eighth, ninth, or tenth day, and the areola is not complete till from the eleventh to the fourteenth or sixteenth day, being also harder, and it is said to revive and decline, continuing to exhibit a brick-red or purplish hue while the hardness remains. The vesicles are usually not more developed than those produced by ordinary lymph. Desiccation is prolonged, and the crust is often retained till the fourth or fifth week."

Certain *local* and *constitutional* symptoms usually accompany the development of the vaccine vesicles. Itching, heat, tension, and pain are experienced in the arm at the time of maturation, with a feeling of stiffness and difficulty in movement. Occasionally erythema or erysipelas breaks out; or the vesicles may ulcerate or slough. The glands in the axilla are often enlarged and tender, especially in adults. There is no primary fever, but a *symptomatic fever* is set up during the process of maturation, and it is said that the temperature may reach as high as 104°. At this time the child is fretful and restless, and the alimentary canal is often deranged. In rare instances severe or even dangerous symptoms supervene, especially in weakly children. A *general rash* is sometimes observed, of a roseolar, lichenous, or vesicular character, which does not usually last beyond a week. These eruptions are more common after vaccination direct from the cow.

RE-VACCINATION.—This is often required in consequence of the primary vaccination, having been insufficient or imperfect, as indicated by deficient number or non-typical characters of the cicatrices. But even when the original vaccination has been in every way satisfactory, it is necessary to re-vaccinate after puberty. Some recommend that the operation should be performed every seven years, but this appears quite unnecessary, and one efficient re-vaccination may be considered as affording absolute and perfect protection. The same precautions and care are required as in the case of primary vaccination. Mr. Purvis noticed fainting as a frequent occurrence during the performance of re-vaccination.

Results of Re-vaccination.—In some cases no effect can be produced by re-vaccination, especially in children. On the other hand, now and then a perfectly typical course is observed, chiefly in adults. Usually the course and characters of the eruption are much modified. It appears earlier; reaches its height by the fifth or sixth day; being either papular, or in the form of an acuminated vesicle, with an indurated, diffused, and irregular areola. A small scab forms by the eighth day, which soon falls off. There is generally much local irritation; and constitutional symptoms are usually conspicuously more marked than in primary vaccination. Erysipelas is liable to occur, and occasionally fatal septicæmia or pyæmia sets in. I have known a patient sink rapidly after re-vaccination, without any obvious cause.

Remote Effects of Vaccination.—There cannot be the slightest doubt in the mind of any unprejudiced observer, with regard to the powerfully protective influence exercised by vaccination against the ravages of small pox. In a large proportion of cases, if vaccination has been thoroughly and efficiently performed, and especially after re-vaccination, there is absolute and complete protection against this malady. But even when it is not entirely prevented, the disease manifests itself only in a slight and modified form, is scarcely attended with any danger, and does not leave behind the hideous disfigurement which it produces if allowed to proceed unchecked. Epidemics have been much less frequent and severe since the introduction of the practice of vaccination, and this result has been in direct proportion to the efficiency of the measures which have been put in force to ensure general and successful vaccination. This has been observed in every part of the world, and among all races. It is very important to bear in mind, that in proportion to the number and typical characters of the vaccination-marks will this immunity from small-pox be the more certain.

It has been stated that certain affections are transmitted to children by vaccination, especially cutaneous diseases, scrofula, and syphilis. There is no reliable evidence that this happens to any serious extent, but cases have been brought forward by Mr. Hutchinson and others which undoubtedly prove that such a result does occasionally occur, and in order to guard against the mere possibility of this evil, it is necessary to pay strict attention to the precautions already alluded to, and especially to see that the vaccine-lymph employed is taken from a perfectly healthy child.

Treatment.—All that is generally required after vaccination is to protect the arm from irritation; and to prevent the vesicles from being scratched. Mr. Purvis recommends that the arm be left entirely out of the sleeve. If there is much subsequent inflammation, wet lint, lead lotion, or cream may be applied; or the part may be covered with flour or finely-powdered starch.

During the pyrexial condition it is well to keep the child in-doors; and to give some mild aperient, such as a tea-spoonful of *castor-oil.* Unusual complications, such as erysipelas, may call for special treatment, and these are particularly to be borne in mind when re-vaccination is performed.

CHAPTER XIII.

VARICELLA—CHICKEN-POX.

ÆTIOLOGY.—Varicella has been supposed to be merely a modified form of variola, but the evidence is conclusive that they are perfectly distinct diseases. It is decidedly an infectious complaint, having a *specific contagium,* and it may be transmitted either with or without direct contact. It is doubtful whether it can be inoculated, but probably not. Occasionally this affection assumes an epidemic form. A second attack is never met with. Varicella is only observed in children as a rule, but now and then affects young or adult females.

SYMPTOMS.—I. *Incubation stage.*—The ordinary duration of the *period of incubation* is twelve days, but it may range from ten to sixteen days. There are no symptoms.

II. *Actual attack.*—1. *Premonitory* or *Invasion stage.*—Frequently this stage is absent, the first symptoms being simultaneous with the appearance of the eruption. In other cases this is preceded for twenty-four to thirty-six hours by slight pyrexia, with headache, and sometimes cough.

2. *Eruptive stage.*—The *eruption* is rarely delayed beyond twenty-four to thirty-six hours at the most, there being at first but a few spots, but fresh crops appear during four or five nights, often in considerable numbers, and they may continue to come out for ten or twelve days. They are quite distinct as a rule, but occasionally a few become confluent. They are first seen usually on the body, especially about and between the shoulders, and over the chest. Afterwards they extend to the limbs, while the scalp is often much affected, but the face is generally only slightly involved, though the eruption is sometimes abundant here. Some authors have described the eruption as being vesicular from the first. In most cases, however, it begins as bright-red spots, slightly papular, not at all hard, and disappearing on pressure. Within a few hours these become vesicular, a clear fluid collecting under the epidermis. The vesicles are of good size, round or oval, ill-defined, and neither umbilicated nor divided into spaces, so that when punctured they collapse completely. There is no inflammatory areola. The appearance is described as being in some instances, "as if the patient had been subjected to a shower of scalding water." In about

twenty-four hours the contents of the vesicles become slightly and uniformly opalescent, and a faint red areola appears. Each vesicle either ruptures or dries up from the third to the fifth day, a small scab extending rapidly from the centre towards the margin. This is generally thin and crumbly, coming away in particles, but occasionally a thick coherent crust is formed. It separates in about four or five days usually. As the skin is not deeply involved or destroyed, only a slight redness is left, which soon disappears, and there is no pitting as a rule; in exceptional instances, however, distinct pits are left, which are round or elliptical, smooth, and shining. Owing to the development of successive crops, vesicles are seen side by side in different stages of their progress. The only subjective sensation which attends the eruption is that of itchiness, which may be considerable. A faint peculiar odour is said to be given off, but this is certainly not constant.

The *general symptoms* are very slight in most cases, there being only a little feverishness, if any. Sometimes there are rather severe exacerbations of fever during the night. Catarrh is frequently present, and may prove dangerous if the bronchi should be extensively implicated. In some cases the patient remains in an unsatisfactory state of health for some time after an attack of varicella.

A number of *varieties* of varicella have been described, but they are of no importance, and most of the supposed varieties are really modifications of small-pox.

PROGNOSIS.—Death never occurs as the result of varicella, and therefore the prognosis is highly satisfactory.

TREATMENT.—Nothing is required but to keep the patient quiet; to give a simple and mild diet; and to see that the bowels are freely opened. Children must be prevented from scratching themselves. Catarrh must be attended to if present; and should there be much fever, a saline mixture is useful. *Quinine* may be administered during convalescence.

CHAPTER XIV.

ERYSIPELAS—THE ROSE—ST. ANTHONY'S FIRE.

ÆTIOLOGY.—Only that form of erysipelas which occurs as an *acute idiopathic* disease is considered in this work, the *traumatic* varieties coming more appropriately within the scope of surgical treatises. Undoubtedly this is an *acute specific disease*, and though its contagious nature is denied by some authorities, there is ample evidence to prove that it is an infectious complaint, and that it is capable of being transmitted from one individual to another, especially when several persons are collected together, as in hospitals. I have met with several instances corroborative of this statement. Sometimes also the affection assumes an epidemic form. The poison is given off into the atmosphere, and may likewise be conveyed by fomites, as well as by direct contact or inoculation. There is reason to believe further, that erysipelas may by infection originate a group o certain allied diseases, such as puerperal fever or hospital gangrene, and *vice versa*.

Though capable of being conveyed by infection, on the other hand many cases of erysipelas are met with in which the origin of the attack certainly cannot be thus explained. Indeed, not unfrequently no obvious *exciting cause* can be discovered, while in some instances the complaint is attributed to local exposure to undue cold or heat; general exposure to cold and wet; very slight injury; irritation of bad teeth; errors in diet, especially the consumption of shell-fish and such articles; and violent mental emotion.

Among the more important *predisposing causes* of erysipelas are:—1. *Age*, the disease being most common in newly-born infants, and in persons from twenty to forty years old. 2. The *female sex*, especially during menstruation. 3. *Individual* and *family predisposition*. 4. The occurrence of *previous attacks*, erysipelas differing from most other acute specific fevers in this respect. 5. Certain *conditions of the system*, viz., plethora; the condition induced by intemperance or debilitating diseases, as well as that associated with gout or renal disease; or any low febrile state. 6. Certain *local conditions*, such as various forms of injury; or the presence of dropsy in a part. 7. A warm *season*.

ANATOMICAL CHARACTERS.—Erysipelas is characterized by a diffuse inflammation of the skin, the subcutaneous cellular tissue being also generally involved, and sometimes the deeper structures. At first there is hyperæmic redness, varying in tint, followed by vesication of the skin, and by serous infiltration of the subjacent areolar tissue, which causes more or less swelling. In severe cases pus may form under the cuticle, in the subcutaneous tissue, or in the deep tissues. There is no tendency to the formation of lymph, so that the inflammatory process is not limited by adhesions; while any pus which is formed is liable to be of a low type. Occasionally erysipelas terminates in ulceration or gangrene, especially when the tissues affected are in a low state of vitality, as, for instance, when they are the seat of dropsy. The neighbouring lymphatic glands and vessels are always affected; while the veins leading from the erysipelatous part are also inflamed in many cases, and may contain pus. Bacteria have been described as being present in abundance in the tissues towards which erysipelatous inflammation is advancing.

In fatal cases the blood is often dark and liquid, and does not coagulate firmly. The various organs are congested, especially the lungs, or they are sometimes the seat of inflammation. The small vessels of the lungs and head frequently contain pus. Minute emboli, composed of white corpuscles or albuminoid particles, have been found in the small vessels of the grey matter of the brain by Bastian and others.

The mucous and serous tissues may be the seat of erysipelatous inflammation, as well as the cutaneous structures.

SYMPTOMS.—After an *incubation-period* which is said to range generally between ten and fourteen days, but which may extend to three weeks, an attack of erysipelas is in most cases, but not invariably, ushered in by *premonitory symptoms* of a general character. There is a feeling of illness, with general uneasiness or muscular pains, disturbance of the digestive organs, sore-throat, headache, restlessness, and other signs of nervous disorder, with a certain degree of pyrexia. Some shivering or chilliness may be felt at the outset, but usually no marked rigors are experienced until the local inflammation is about being, or has been developed. These symptoms may last from a few hours to four or five days before the characteristic signs of erysipelas appear, but generally the latter are evident within two or three days. Epistaxis occasionally occurs at the period of invasion.

The *local signs* of erysipelas are as follows:—At first there is a feeling of heat, irritation, and tightness in the affected part; the skin is tender to the touch; and it has a stinging or smarting sensation. Soon the surface becomes red, swollen, firm, tense, and shining, at the same time all the painful sensations being aggravated, and there being increased local thermometric heat. Sometimes the swelling precedes the redness.

The inflammation starts from one spot, and generally extends chiefly in some particular direction, but it sometimes spreads in all directions equally. There is a well-marked boundary-line between the advancing inflammation and the healthy skin, as shown by the difference in colour, and by the abrupt termination of the swelling, but only a gradual transition is observed at that border where the process is subsiding.

The hue of the redness varies, but it tends to become darker as the case progresses. The swelling is much greater where abundant loose cellular tissue exists, and is then often irregular in form and unequal in consistence, while the surface pits on pressure. In structures which are tense, unyielding, and closely attached, such as those of the scalp, the sensations are far more painful than in lax tissues.

In slight cases the inflammation subsides, being followed by desquamation of the cuticle; far more commonly, however, cutaneous vesicles of various sizes form, which contain a yellowish serum, and in serious cases large irregular bullæ or bladders are raised. These burst and discharge their contents, often leaving crusts, which on separating may disclose superficial ulceration. The cuticle always peels off extensively. Occasionally signs of more or less suppuration, ulceration, or moist gangrene are observed; and these processes may lead to great destruction of tissues.

The *seat* and *extent* of the inflammation vary in different cases. Idiopathic erysipelas is most common about the head and face, and it generally begins about the nose, ear, angle of the mouth, lower eyelid, or cheek. Dr. Reynolds has observed that it usually starts at the point where the skin is undergoing transition into a mucous membrane. The erysipelas tends to spread rapidly, so that the whole face, scalp, and neck may become speedily affected, and great swelling is produced, the features being obliterated, the eyelids closed, and the nostrils blocked up, while deafness is often complained of. Not unfrequently abscesses form, especially in the cheeks or eyelids. The inflammation is apt to extend to the mouth and fauces, and may even reach the larynx. There is also a danger of the supervention of meningitis.

In some instances the limbs are affected, especially the legs, and now and then the trunk. I have met with two cases of erysipelas involving the whole of both legs, as a complication of acute rheumatism. Some local irritation may determine the locality of an erysipelatous inflammation.

The *time* taken by erysipelatous inflammation in running its course varies, but the redness and swelling generally attain their height on the second or third day. Different parts of the surface are seen in different stages of advancement. After it has apparently stopped, the inflammation may again spread, and *relapses* are by no means uncommon. In some cases the complaint is *erratic* or wandering in its progress, or it may be *metastatic.*

Usually the absorbent glands and vessels in the neighbourhood of the affected structures show signs of irritation, being enlarged, painful and tender, sometimes very much so, and they may be involved first. Suppuration of the glands takes place in exceptional cases.

The *general symptoms* usually increase with the onset of the local inflammation. Ordinarily they merely indicate more or less pyrexia. The pulse rises to 100 or 120, and is full and strong. The temperature ascends rapidly at the outset, and may attain a height of 104° or 105° on the first evening of the eruption. Usually the maximum temperature is reached on the third day, but it increases so long as the inflammation advances, and may attain to 106° or 108°. As a rule there are distinct evening exacerbations, but the evening temperature may be 2°, 4°, or even 5° lower than that of the morning (Reynolds). Defervescence sets in in favourable cases about the fifth or sixth day of the eruption, and the temperature rapidly falls, becoming normal in from twelve to thirty-six hours. It may, however, remain high for a much longer time, and defervescence is then less critical. These observations apply chiefly to *facial erysipelas*, for great deviations as regards temperature are met with when the disease attacks other parts. Any relapse or extension of inflammation is indicated by a rise in temperature, which may be noticed before any external signs are observed. Complications will also influence the temperature. The urine is febrile, while urea is increased, and chlorides are diminished. Albuminuria is a frequent phenomenon in cases of erysipelas.

In *facial erysipelas* there is considerable restlessness, with, in many instances, mental wandering or actual delirium, especially at night, quite apart from any cerebral complication. In this form the tongue always tends to become dry and brownish ; and in all cases of a low type it assumes distinctly adynamic characters, with sordes on the lips and teeth, the pulse also becoming very rapid and feeble, and other typhoid symptoms setting in. This course of events is likewise apt to occur in very feeble and intemperate persons, and in aged subjects.

Complications.—The *complications* to be chiefly feared in connection with erysipelas are cerebral or spinal meningitis; bronchitis; intestinal catarrh; and renal congestion or inflammation. As already mentioned, erysipelas may spread to the throat or larynx; or it may involve serous membranes.

Varieties.—Several varieties of erysipelas are described, founded on the intensity, mode of progress, appearances, and terminations of the local changes. The chief of these are:—1. *Simple* or *cutaneous*. 2. *Miliary*. 3. *Phlyctenous*. The last two are named from the size of the vesicles or blebs. 4. *Œdematous*, where there is much œdema. 5. *Phlegmonous* or *cellulo-cutaneous*, in which the deep tissues are extensively involved, and tend to suppurate. 6. *Gangrenous*. 7 *Erratic* or *migratory*. 8. *Metastatic*. Varieties are also named according to the part affected, *e.g.*, *facial*, *scrotal*, *crural*, *abdominal* &c.

The *erratic* form usually presents less hyperæmia and swelling than is usually observed; and the pyrexia is not so severe, while considerable and rapid changes in temperature are observed. This variety tends to run a protracted course, and occurs chiefly in the old, or in those suffering from gout, rheumatism, or kidney disease.

Prognosis.—Erysipelas is always a serious malady, and a cautious prognosis should be given in all cases, but especially when it attacks the scalp or face. The principal circumstances which increase the danger of any individual case are as follows:—1. The patient being either very young or of advanced age. 2. A low condition of the system, especially that due to intemperance. 3. The presence of organic disease, particularly renal disease with dropsy. 4. The complaint being epidemic, much depending on the type of the epidemic. 5. Any tendency to typhoid symptoms; or signs of blood-poisoning. 6. Severe cerebral symptoms, particularly if they point to meningitis. 7. Extension of the inflammation to the throat or larynx. 8. A dark colour of the eruption, or the appearance of livid vesicles. 9. Any disposition to involve the deep tissues extensively, or to end in suppuration or gangrene. 10. The sudden disappearance of the eruption, with simultaneous occurrence of symptoms indicating that some internal part is attacked.

Treatment.—*General.*—Unquestionably lowering measures are to be avoided in the management of most cases of erysipelas, and a supporting treatment is that which gives the best results. A nutritious *diet* is necessary from the first, with cooling drinks, and in many instances *stimulants* are called for at an early period, not uncommonly considerable quantities being required during the progress of the disease. Ringer highly commends the administration of *tincture* of *aconite* or *belladonna*, to check the complaint.

The patient should, if possible, be isolated, and placed in a comfortable, well-ventilated, but not draughty apartment; and every attention must be paid to hygienic measures.

The bowels should be kept well opened by *saline aperients*. The most reliable medicinal remedy, as a rule, in erysipelas is *tincture of steel*

—♏ xxx-xl. every three or four hours. In adynamic cases *quinine* or *ammonia* and *bark* may be given, along with alcoholic stimulants. It is often necessary to administer *opium*, *chloral*, *bromide of potassium*, or some such agent, at night or more frequently, for the purpose of procuring sleep and relieving pain.

Local.—Ordinarily it will be found the best plan to cover the erysipelatous part with cotton wool, having previously powdered it over with flour, or with a mixture of starch and oxide of zinc. When the face is affected, a kind of mask may be made, with apertures corresponding to the mouth, nostrils, and eyes. Among the numerous *local applications* recommended by different practitioners, the most important are *collodion*, or a mixture of *collodion* and *castor oil; nitrate of silver*, either in the form of the solid stick or in solution; *extract* or *liniment of belladonna*; and solution of *carbolic acid.* In some cases great pain is experienced, and then warm fomentations containing *opium* or *belladonna* are serviceable, the surface being afterwards dried and covered with wool. *Nitrate of silver* is often used with the object of checking the progress of erysipelas, the stick being rubbed into the skin a little beyond the advancing margin of the inflammation. This measure appears to succeed sometimes. Suppuration calls for free incision; and in the phlegmonous variety scarification is of great value.

Symptomatic treatment.—Various symptoms may require attention in erysipelas, as well as complications, especially meningitis, and extension of the inflammation to the throat or larynx. The treatment of these conditions will be considered in their respective chapters, but it may be here mentioned, that if there is much œdema about the glottis, it may be requisite to scarify the mucous membrane in this part, or even to perform laryngotomy or tracheotomy.

Prevention.—In order to prevent the spread of erysipelas, it is imperative upon those who are attending cases of this complaint, especially medical men and nurses, to exercise every precaution against conveying the disease to others, particularly if they have to come into contact with parturient women, or with persons suffering from wounds or ulcers.

Chapter XV.

DIPHTHERIA.

Ætiology.—Diphtheria is an independent *acute specific disease*, being ordinarily produced by a *specific poison*, and of a highly infectious nature, not unfrequently assuming a severe epidemic form. The contagium is believed by some authorities to be associated only or chiefly with the peculiar deposit which forms on the throat and other parts, and it has been asserted that this material must be brought into contact with a mucous membrane, or with an abraded cutaneous surface, before the complaint can be transmitted; there is strong reason to believe, however, that the contagium is also given off in the breath, and is likewise probably contained in the various excretions. The disease may spread to any of the inmates of a house, but there is always much more danger of infection in the case of those who are brought into close contact with a patient suffering from diphtheria, and who therefore inhale the breath, or are liable to have the morbid products coughed out upon them. Infection lasts for an uncertain time after convalescence. The affection is more liable to be propagated if there is much discharge, as from the nose, especially if cleanliness is not attended to. The poison clings tenaciously to houses and rooms for a considerable period, and may be conveyed by fomites. It is a matter of doubt whether diphtheria can be originated by inoculation with the deposit. The same individual may be attacked more than once.

Of the exact nature of the contagium of diphtheria there is no real knowledge. It has been assumed to consist in certain vegetable organisms, which have been observed in the diphtheritic deposit on microscopic examination, but there are strong proofs against any such theory. It has been affirmed that there is a *sporadic* form of this disease, which is not contagious, but which is produced by unfavourable hygienic conditions, especially by drainage emanations. Cases have come under my notice which certainly appeared to bear out this assertion.

The *predisposing causes* of diphtheria are the period of childhood; individual and family susceptibility; bodily fatigue or exhaustion; and nervous excitability. Anti-hygienic conditions do not seem to have much effect in propagating the disease. Hot and dry climates and seasons appear to favour the development of the poison-germs.

ANATOMICAL CHARACTERS.—A peculiar inflammation of the fauces, attended with the formation of patches of exudation, constitutes the ordinary local manifestation of diphtheria. At first there is redness, which may begin in any part of the throat, being accompanied with swelling and increased secretion of viscid mucus. The redness spreads over the entire mucous surface, and then the exudation makes its appearance. The deposit may commence at any spot, such as on one of the tonsils, on the soft palate, or at the back of the fauces, and may start from one or several points, at first only small specks being observed, which, however, speedily extend and coalesce so as often to form extensive patches, or even to cover uniformly the entire surface. The patches have a variable thickness, and they become thicker by successive layers being formed underneath. The characters of the lymph vary much. The colour is usually grey, white, or slightly yellowish; but it may be brownish or blackish. The consistence ranges "from cream to wash-leather." The material resembles in some cases wet parchment, or damp and dirty wash-leather. On removing it, which is effected with more or less difficulty, a raw bleeding surface is left, or sometimes a distinct ulcer, which is again speedily covered by fresh deposit, the exudation forming in the substance of, as well as upon the mucous membrane, thus causing its destruction. The under surface of a patch may present little spots of blood. If the exudation separates of itself, it is either not renewed at all, or only in thinner films. Occasionally considerable ulceration or sloughing of the soft palate, uvula, or tonsils is set up; or abscesses may form.

The deposit may spread from the throat to the mouth, lips, nose, conjunctiva, larynx, trachea, or bronchi, even to their finest ramifications; rarely to the œsophagus, stomach, intestines, and gall-bladder. In exceptional instances it starts primarily in certain of these parts. It has also been observed over the vagina and rectum. Any raw cutaneous surface is liable to become implicated.

The microscope reveals that the diphtheritic material consists chiefly of epithelial and granular cells, with molecular granules of fat and protein. Sometimes fibres and disintegrated tissues are visible. Vegetable growths have also been observed, but they are not always present, and similar organisms are met with in other morbid products. Chemically the substance chiefly resembles fibrin.

The *lymphatic glands* in the neighbourhood are enlarged and inflamed, especially those near the angles of the jaw. Should there be much ulceration or gangrene of the fauces, general swelling of the neck ensues, owing to infiltration of the tissues with serum or lymph.

In fatal cases the various organs are found to be much congested. The spleen and the absorbent glands generally are enlarged. The lungs are in many cases the seat of acute insufflation, collapse, lobar or lobular pneumonia, or sometimes of apoplexy. The kidneys may show signs of parenchymatous inflammation. Fibrinoüs coagula are frequently observed within the cavities of the heart, and extending thence into the great vessels.

SYMPTOMS.—Diphtheria is essentially a *general* disease with *local* lesions. Hence it is usually ushered in by *general* or *constitutional symptoms;* followed by *local symptoms,* referable to the throat or to other parts which may become involved. Along with the development of local symptoms, the general disturbance is increased, and may become extremely severe; while the complaint is liable to be followed by a peculiar nervous disorder.

The *period of incubation* in diphtheria ranges usually from two to four days (Squire). It may be limited to thirty hours, or extend to eight days, or perhaps even to a longer period than this. The *invasion* is generally gradual, a feeling of illness, languor, more or less weakness, and depression being often experienced; accompanied with chilliness, anorexia, nausea, diarrhœa, headache, drowsiness, and a certain degree of pyrexia. At the same time some stiffness of the neck, tenderness about the angles of the jaw, or slight sore-throat may be complained of.

The symptoms of the developed disease vary considerably in character and severity, and it is important to notice that the *gravity of the constitutional disorder bears no necessary relation to the throat-symptoms.* Sir William Jenner has arranged cases of diphtheria into certain groups, which, however, are not absolutely distinct, as they often run into each other.

1. *Mild Form.*—Here there are slight throat-symptoms, and on examination signs of inflammation, with more or less exudation, are visible. The glands about the angles of the jaw are a little swollen and tender. Pyrexia is usually mild and of short duration, but the temperature may rise considerably. The urine is not albuminous. Occasionally extensive deposit on the throat is observed, while the general symptoms are scarcely perceptible. Recovery is rapid and complete; and no sequelæ follow the attack. It must be remembered, however, that in cases which at first seem to be of a very mild character, serious symptoms may subsequently arise.

2. *Inflammatory Form.*—After premonitory symptoms, high pyrexia sets in, the patient at the same time feeling very ill and weak. The pulse soon tends to become feeble and wanting in tone. Throat-symptoms are prominent, while examination reveals signs of marked inflammation, which may be accompanied with much enlargement of the tonsils and uvula, a considerable deposit of exudation forming in from twelve to forty-eight hours, which possesses a fair degree of consistence and toughness. This may be coughed up in pieces of so-called *false membrane*, of variable size.

Subsequently the throat may ulcerate or slough more or less extensively. The disease is also liable to spread to the larynx or further down the respiratory passages, thus giving rise to dangerous laryngeal symptoms, and causing serious interference with respiration. The glands of the neck are much enlarged. The urine is febrile, but also frequently contains much albumen, as well as some granular casts.

3. *Insidious Form.*—Without any particular general disturbance, and only slight sore-throat, laryngeal symptoms suddenly set in with severity, and this may terminate in speedy suffocation.

4. *Nasal Form.*—In this variety there is at first a sanious discharge from the nose, accompanied with low fever. Soon the throat is seen to be red and swollen, and fluid escapes through the posterior nares, while the glands about the angle of the jaw swell considerably. The discharge may be very fœtid. Afterwards the deposit may form on the pharynx or larynx, the latter being sometimes unexpectedly attacked; or the symptoms may subside, and recovery take place.

5. *Primary Laryngeal Form.*—This is characterized by the exudation starting in the larynx, but it may subsequently spread to the pharynx. Laryngeal symptoms are therefore prominent from the first. The disease may extend downwards along the air-passages to the lungs. Some authorities regard this variety as identical with *true croup* or *croupous laryngitis*.

6. *Asthenic Form.*—In this class of cases the general symptoms assume a low type, either from the outset, or during the progress of the ordinary symptoms of diphtheria. The sense of illness and prostration becomes very great; the complexion is dirty-looking and opaque, and the skin generally may assume a dirty-yellowish tint, having also a peculiar feverish pungency, though the temperature is not remarkably high. The pulse tends to be very frequent, small, weak, and irregular; and the heart's action is greatly en-

feebled. The tongue becomes dry and brown, while sordes form on the lips and teeth. Ultimately the ordinary *typhoid* symptoms set in, with delirium and other low nervous phenomena, and at last the patient sinks.

The symptoms just described may or may not be associated with much deposit over the throat or larynx, but this is frequently of a soft, pulpy kind, and hence the local symptoms are often not proportionately severe. They are not uncommon in the nasal variety of diphtheria. It is in these cases that extensive ulceration and sloughing are chiefly met with, the asthenic symptoms being due to toxæmia, resulting from absorption of the decomposing matters into the blood. Under such circumstances the breath becomes very fœtid; and there is great swelling about the neck.

COMPLICATIONS AND SEQUELÆ.—*Albuminuria* is of very frequent occurrence during the course of diphtheria, and the quantity of albumen passed is sometimes extreme. Casts may be present in the urine at the same time; as well as more or less blood. These conditions may be associated with morbid changes in the kidneys, especially in the epithelium lining the tubes, but the relation of these changes to the general disease is not determined. Occasionally the urine is suppressed. *Hæmorrhage* from the nose, throat, air-passages, and other parts is not uncommon in bad cases, and there may be purpuric spots on the skin. An *erythematous* or *erysipelatous rash* is occasionally observed. *Pulmonary complications* are not infrequent, especially if the respiratory passages are involved, viz.: —acute insufflation of the lungs, the vesicles sometimes giving way; pulmonary collapse; lobar or lobular pneumonia; and pulmonary apoplexy. It must be remembered also that the diphtheritic exudation may extend even to the smallest bronchi.

Diphtheria is liable to be followed by important *sequelæ*. Thus, in some cases the progress towards convalescence is very slow, and a state of marked debility and anæmia remains for some time. Slight *albuminuria* may continue for a considerable period. The most remarkable series of sequelæ, however, are those connected with the *nervous system*. These may follow the mildest attack, but are more frequent and more marked in severe cases. Generally a period of apparent convalescence intervenes, the duration of which varies from a few days to some weeks, but the symptoms appear in most cases within three weeks.

The precise nature, extent, and intensity of the nervous disorder vary in different cases, but the phenomena observed generally point to paralysis, both motor and sensory. In some instances they are localized, especially in connection with the pharynx and palate, so that the voice becomes altered, and swallowing is performed with difficulty, which condition may last for a considerable time. True *diphtheritic paralysis*, however, is characterized by being more or less progressive, and attacking different parts in succession, so that ultimately the whole body may be implicated. It starts usually in the throat and palate, the voice consequently becoming snuffling or inarticulate; while deglutition is difficult, fluids being apt to pass into the nares, and solids giving rise to a choking sensation, with violent irregular action of the muscles. At the same time the mucous membrane in this part is more or less deficient in sensibility. The tongue, lips, and cheeks may then become involved. Vision is apt to become suddenly impaired, from paralysis of the ciliary muscle, the power of adjusting the eye being lost; at the same time the iris is affected, and squinting may be observed. The limbs are next liable to be attacked, indicated at first by tingling and numbness in the fingers and toes, with impairment of touch, which phenomena spread upwards, power at the same time becoming diminished, so that at last the patient has no control over the voluntary movements, and cannot stand or move. After a time the muscles waste and become flabby. The head sometimes rolls from side to side, owing to paralysis of its supporting muscles. The bladder may be involved, giving rise to retention of urine; or there is constipation, owing to the abdominal muscles being affected. In some cases urgent danger arises from the respiratory muscles being attacked, so that breathing cannot be carried on. Serious symptoms may also supervene owing to implication of the heart, its beats becoming very infrequent, being sometimes reduced to 16 per minute, as well as slow and weak, and finally the organ may entirely cease to act.

Abnormal sensations are often complained of in various parts, as well as hyperæsthesia and tenderness. Intense neuralgia also sometimes follows diphtheria.

The duration of these nervous symptoms varies much. Usually the termination is favourable in adults, provided the respiratory muscles and heart do not become involved, but in children it is frequently fatal.

Duration and Terminations.—The *duration* of diphtheria ranges from two to fourteen days, but its complications and sequelæ may prolong it greatly. *Relapses* also are not very uncommon. Death is a very frequent event, especially in some epidemics. The chief causes of death are:—1. *Suffocation*, owing to the air-passages being implicated, which is most frequent in children, and generally happens within the first week. 2. *Gradual asthenia*, most common in persons beyond the age of puberty, and usually taking place after the first week. 3. *Septicæmia*. 4. *Uræmia*. 5. *Pulmonary complications*. 6. *Secondary nervous disturbance*. This is very fatal in children, but death does not occur from this cause after a lapse of two months. Occasionally patients attacked with diphtheria die within a few hours, apparently killed by the virulence of the poison. Sudden death has also happened in several instances, which has been attributed to syncope; or to the formation of a fibrinous coagulum within the heart, or in one of the great vessels.

Prognosis.—Always grave, the prognosis of diphtheria is much worse in children than adults. The chief signs of danger are:—implication of the air-passages, with consequent interference with respiration, as well as the development of pulmonary complications; extensive ulceration or sloughing of the throat; great discharge from the nares; epistaxis; repeated vomiting or diarrhœa; very rapid and feeble cardiac action and pulse, or a very infrequent pulse; typhoid symptoms, especially if accompanied with delirium; suppression of urine; signs of uræmia; the presence of albumen, blood, or casts in the urine, particularly if these are abundant; and a sudden rise in temperature. Even mild cases may prove fatal from asthenia; or the nervous sequelæ may set in and cause death.

TREATMENT.—The management of cases of diphtheria must depend very much on their type and intensity, but even the mildest case needs to be carefully watched in its progress, so that the practitioner may be prepared for any untoward course of events. It cannot be too strongly enforced that there is no specific remedy for this disease, and that the measures to be adopted must be guided by the circumstances of each individual case. It may be further affirmed that lowering measures are never admissible, a more or less supporting treatment being always indicated for diphtheria.

Any patient suffering from diphtheria must remain in bed, the room being kept at a good, uniform temperature, and all hygienic conditions being duly observed, especially as regards *cleanliness* and *proper ventilation*. In a severe case it is important that the air of the room should be maintained at a temperature of 65° to 68°, and kept moist with steam, by allowing a kettle having a long spout to be continually boiling, or by boiling water in an open vessel over a spirit lamp. Children should have a tent made over their cribs by means of curtains or blankets, the steam being conducted within this by means of an elastic tube fixed on the spout of the kettle. Disinfectants should be placed about the apartment; and every precaution must be taken against the spread of the disease.

In a mild case of diphtheria it is sufficient to open the bowels; to administer some simple saline mixture; to allow a good quantity of beef-tea and milk; and to employ soothing local remedies, viz., warm poultices or fomentations over the throat, and some mild gargle, such as milk with warm water, *infusion of roses*, or a weak solution of *chlorate of potash*.

In cases which are at all severe the *general treatment* demands strict attention. In the first place nutritious *diet* should be given from the outset, including abundance of milk and beef-tea. The patient should also take cool drinks freely, and suck small lumps of ice at frequent intervals. If there are any signs of depression, considerable nutriment is called for. *Alcoholic stimulants* are not required at first in most cases, but they must be given as soon as there is any indication that the powers of the system are failing. They are often needed in large quantities in adynamic cases, and children bear them well. The best stimulant ordinarily is brandy, some of which may be administered beaten up with eggs. Good port-wine and iced champagne are also very valuable. If a patient cannot or will not swallow, it is highly important to administer food and stimulants, as well as medicines, by means of enemata, and the remarks made with reference to children suffering from scarlatina apply equally in the case of diphtheria.

As regards *medicinal treatment*, a mild *aperient* may be given daily, if required, in order to keep the bowels open. A saline drink, such as a solution of *citrate of potash*, or still better, one containing *chlorate of potash*, (ʒ i. to Oi.) is decidedly useful. The most valuable medicine in most cases of diphtheria is *tincture of steel*, which should be administered in full doses—♏xx—xl every two or three hours. It may be beneficially combined with *quinine* or with *dilute hydrochloric acid*. Dr. Wade recommends *iodide of potassium* (gr. ij to iv), with *chlorate of potash* (gr. v to x) every two or three hours. Others have great faith in *antiseptic* medicines, but, in my opinion, these agents cannot be solely relied upon. Should adynamic or typhoid symptoms set in, *ammonia* and *bark*, *camphor*, *ether*, *musk*, and such remedies are called for.

Local treatment in connection with the throat is of essential importance, and in every case demands careful consideration. On no account must the membranous patches be torn off, though some high authorities, including Trousseau, have advocated this measure. *Topical applications* are called for, which may be made either by means of gargles; inhalations; the throat-brush; atomized spray; or by blowing in powders through a straw or quill. The latter methods are especially useful in the case of children. It must be acknowledged that there is considerable difficulty in deciding what applications answer best, eminent authorities who have had extensive experience in the treatment of diphtheria, differing widely in their opinions on this subject. There is reason to believe, however, that benefit is derived, *at an early period*, from the direct application of certain powerful remedies to the throat, by means of the brush. These applications seem to check the advance of the deposit, and to prevent its extension. Those most employed are solution of *nitrate of silver; dilute hydrochloric acid;* and equal parts of *tincture of steel* or *liquor ferri perchloridi* with *glycerine*. Some recommend the repeated use of one or other of these applications; but it is better to follow the plan advocated by Sir William Jenner, viz., that of making one thorough and efficient application, around as well as over the patches. He advises that a solution of *nitrate of silver* (℈i to ʒ i of water) should be employed, the surface around the exudation being touched with the solid stick; or a mixture of equal parts of *hydrochloric acid* and water.

Gargles are valuable if the patient is old enough to use them, the most serviceable being one containing *tincture of iron* and *glycerine*; or a solution of *chlorate of potash* with *dilute hydrochloric acid*. Solution of *phosphate of soda* has been recommended, with the view of dissolving the false membrane. *Antiseptic* gargles are also often very serviceable, such as one containing *carbolic acid*, *Condy's fluid*, or *hypo-chlorite of soda*, particularly if there is any tendency to gangrene or ulceration, when it has also been recommended that solid caustic should be freely applied. The use of *sulphurous acid* spray, applied by means of the atomizer, has been found very efficacious. The plan of blowing in powders has also been commended, a mixture of *alum* and *sugar*, as well as *tannin*, having been employed in this way. When there is any discharge from the nose, the nasal cavities should be frequently washed out by means of antiseptic injections through the nostrils; while similar applications may be made to the posterior nares from the throat.

The treatment which should be adopted when the *larynx* is involved has been a subject of much controversy. If the difficulty of breathing is only moderate, relief may be afforded by giving an *emetic*, by means of which some of the exudation may be got rid of. Paroxysmal dyspnœa may also be relieved by *chloroform* or *ether*. Should there, however, be evidence of considerable obstruction to the breathing, while the exudation continues to increase, the only possible hope lies in the performance of *tracheotomy* or *laryngotomy*, the former being applicable for children, the latter for adults. Sir William Jenner urges that the trachea should be opened as high up as possible, and recommends that the edges of the wound be touched with caustic. The utmost precautions must be taken after the operation, with the view of preventing inflammation of the respiratory organs. The tracheotomy-tubes must also be kept properly cleansed. The operation almost always affords temporary relief and prolongation of life; ultimately the issue is very frequently fatal, but still cases do sometimes recover when apparently in almost a hopeless condition. Dr. B. W. Richardson has recorded a case, (*Medical Times and Gazette*, July 17th, 1875), in which the employment of artificial respiration, by means of the double-acting bellows, was efficacious in saving the life of a patient when *in extremis*, after tracheotomy had been performed. If signs are present indicating that the bronchi are extensively involved, no advantage can be derived from opening the wind-pipe.

Symptoms or *complications* may need attention in diphtheria. It is important to look to the urine, and should there be any signs of suppression, poultices and fomentations should be freely applied over the loins, or dry cupping may be employed.

In order to hasten *convalescence*, change of air is most useful, especially to the seaside. Good diet is also essential, with *tonics* and *cod-liver oil*. For the nervous sequelæ, the best remedies are *quinine*, *iron*, and *strychnine*, along with a supporting and nutritious diet, which should include a moderate supply of stimulants. Blistering the nape of the neck has sometimes proved beneficial. Galvanism may be employed in connection with paralyzed parts.

CHAPTER XVI.

MUMPS. IDIOPATHIC PAROTITIS.

ÆTIOLOGY.—Mumps is probably an *acute specific disease*, and there is every reason to believe that it is infectious. Almost always the complaint assumes an epidemic form, but it may be localized in houses or institutions where a number of young persons are aggregated together. It rarely occurs except in young individuals, being very common about the period of puberty, and also from five to seven years of age. Males are much more frequently attacked than females. Epidemics are most prevalent in spring and autumn.

ANATOMICAL CHARACTERS.—Mumps is chiefly characterized anatomically by inflammation of one or both parotid glands. Some pathologists are of opinion that the process begins in the cellular tissue which pervades the gland-structure; others believe that a catarrh of the gland-ducts first occurs. The affected gland is hyperæmic and enlarged, being infiltrated with a serous fluid. Fibrinous exudation is not often observed, and a most important point to notice is, that extremely rarely is there any tendency to the formation of pus. The tissues around are more or less infiltrated. As a rule the swelling rapidly subsides, and the gland returns to its normal condition. Occasionally the submaxillary gland is involved; and the testicles or other parts may be the seat of metastatic inflammation.

SYMPTOMS.—The *period of incubation* for mumps varies from fourteen to twenty-two days. In most cases there is some degree of premonitory fever, which lasts from one to three days before local symptoms are manifested, but occasionally they come on simultaneously. Pyrexia usually continues throughout the attack, but may subside on the appearance of the local signs, and it is seldom severe, nor does the patient feel particularly ill. A swelling or fulness appears in the region of either parotid gland, commencing just below the external ear, and then extending up to the zygoma, as well as to a variable extent over the face and down the neck, thus giving rise to much disfigurement. It has an elastic feel, being firmer over the centre than at the circumference. The skin may be reddened over the swelling, but is frequently unaltered. More or less pain or uneasiness is felt, with a sense of tension, increased by opening the mouth, by masticating, or by swallowing; there is also tenderness on pressure. Salivation occurs now and then, and occasionally deafness is complained of. In the great majority of cases the swelling subsides about the fifth or sixth day, and has quite disappeared in two or three days more; but in the meantime the gland on the opposite side frequently becomes affected, and goes through a similar course, or both may be involved simultaneously. A hardness occasionally remains for some time; and in very exceptional instances abscesses form in the gland, which open externally, or into the external auditory meatus. The submaxillary gland is sometimes attacked; and the surrounding lymphatic glands, as well as the tonsils, are often enlarged.

An important character of this disease is its liability to *metastasis*, especially in adults. This event may be preceded by some dangerous symptoms. The testicle is most frequently attacked, orchitis setting in as the inflammation subsides in the parotid, with effusion into the tunica vaginalis and œdema of the scrotum. Occasionally the parotid and testicle are affected at the same time, or alternately for several times in succession. The orchitis generally runs a favourable course, but it may lead to wasting of the testicle. In females the labia, mammary gland, or ovary may be attacked in the same way. Meningitis has been stated to have occurred in very rare instances.

TREATMENT.—In most cases but little treatment is required. It is necessary to keep the patient indoors, in a comfortable room, or even in bed if the case is at all severe. An *aperient* is useful at the outset, and the bowels should be kept regularly open. *Saline* medicines may be given, so as to promote the action of the skin and kidneys; and during convalescence *quinine* is serviceable. The *diet* should consist of liquids, especially milk and beef-tea. The only *local* treatment generally needed is to use hot fomentations, and to cover the part with cotton-wool. The application of a leech or two may possibly be required. If an abscess forms it must be opened; and any hardness that is left may be removed by friction with oil, or by painting the surface with *tincture of iodine*. When metastasis takes place, it is recommended to endeavour to excite the return of inflammation in the parotid, by means of mustard poultices or blisters. Orchitis must be treated by rest and fomentations.

CHAPTER XVII.

HOOPING-COUGH—PERTUSSIS.

ÆTIOLOGY—Hooping-cough is generally regarded as an infectious disease, depending upon a *specific poison*, which may travel a considerable distance through the atmosphere, or be conveyed by fomites. It is chiefly given off in the breath. The disease commonly occurs in an epidemic form, but may be sporadic. It may be communicated by infection before the characteristic "hoop" is developed. A second attack is scarcely ever observed.

The chief *predisposing causes* are childhood, especially after the second year; a cold and damp season or climate; and exposure to all causes of "cold."

ANATOMICAL CHARACTERS AND PATHOLOGY.—Most authorities regard hooping-cough as a peculiar catarrh of the mucous membrane of the air-passages, attended with hyperæsthesia; others think that it is either entirely or partly due to some morbid condition in connection with the vagus nerve. There may be evidences of catarrh in fatal cases, but frequently these are absent. Those who advocate the nervous origin of the disease have described signs of inflammation about the vagus nerves; enlarged bronchial glands pressing upon these nerves; or congestion of the medulla oblongata and its membranes. In most cases, however, none of these conditions are observed. The most important morbid conditions associated with hooping-cough are those which are of the nature of complications, viz., bronchial catarrh; lobular collapse of the lungs; acute insufflation or emphysema; dilatation of the bronchi; and catarrhal pneumonia. Rarely croup or meningitis may be present.

SYMPTOMS.—The *period of incubation* for hooping-cough is uncertain, but Dr. Squire has found evidence of the development of the disease as early as from two to four days after exposure to infection. The symptoms are divided into certain stages.

First or *Catarrhal stage*. At the commencement hooping-cough presents no characteristic signs, there being merely pyrexia, which is often sharp, accompanied with signs of catarrh, viz., running from the nose, sneezing, redness of the eyes, frequent and usually severe paroxysms of cough, at first dry, but soon attended with a peculiar expectoration. This stage may last from two days to two or three weeks or more, and its duration and severity will indicate the probable duration and intensity of the entire disease.

Second or *Spasmodic stage*. The fully-established disease is characterized by peculiar fits of spasmodic cough. A paroxysm generally sets in abruptly without any obvious cause, being in many cases preceded by a sensation of tickling in the throat, or some other unpleasant feeling. The cough is very severe and distressing, consisting of a number of short, quick, spasmodic or convulsive, and forcible expiratory puffs, follow by a prolonged, clear, shrill inspiratory sound or "hoop," these alternating for a variable number of times; if the fit is of very long duration, the cough at last becomes almost inaudible. It is usually terminated by the expectoration of a considerable quantity of thick, viscid, clear fluid, which may also be discharged through the nose; and not uncommonly vomiting takes place. Breathing being interfered with, the child presents the appearances characteristic of non-aëration of the blood and venous congestion, and in prolonged attacks may become almost asphyxiated. Usually there is a feeling of much exhaustion, with soreness about the muscles of the chest, after a paroxysm, but these sensations soon pass away. As accidental occurrences may result bleeding from the eyes, nose, mouth, ears, or rectum; involuntary discharge of urine and fæces; hernia or prolapsus ani; or convulsions. *Physical examination* of the chest during a fit reveals that air does not enter the lungs properly. The physical signs of pulmonary complications can often be detected.

The *frequency* and *duration* of the paroxysms vary greatly, the one being generally in proportion to the other. As a rule the disease becomes intensified up to a certain point, attaining its height at about the end of the third, fourth, or fifth week, and then it subsides gradually.

During the *intervals* the patient is usually apparently well, but in severe cases there may be prolonged exhaustion, languor and debility, loss of appetite, headache, sleeplessness, pyrexia, and other symptoms; or various complications may give rise to their special clinical phenomena.

To Dr. T. Morton (*British Medical Journal*, June 10th, 1876) belongs the credit of having independently observed, and drawn attention to the frequent occurrence of ulceration about the frœnum linguæ in cases of hooping-cough. This phenomenon has been long known on the Continent, but in this country it has hitherto attracted but little notice. The ulcers are usually very small, and circular or oval in shape. Their relation to hooping-cough is doubtful. They have been regarded as being of a specific nature; or as having a causative relation to the complaint. Probably, however, they are produced by the violent paroxysms of cough.

Third or Decline stage. There is no sudden transition to this stage, but a gradual diminution in the frequency and intensity of the paroxysms, while the cough loses its special characters, and expectoration becomes more easy, the sputa assuming an opaque and muco-purulent appearance, resembling the expectoration of ordinary bronchial catarrh; at the same time vomiting ceases. The general health also improves. Finally the cough ceases altogether, and the patient is convalescent.

COMPLICATIONS AND SEQUELÆ.—Some of these are directly due to the cough; others are accidental. The chief *complications* and *sequelæ* include bronchitis, which may become capillary; lobular collapse; emphysema or acute insufflation; rupture of air-vesicles, followed by subcutaneous emphysema; catarrhal pneumonia; pleurisy; phthisis; acute tuberculosis; croup; convulsions; cerebral apoplexy; meningitis; hernia; gastritis or enteritis, with obstinate vomiting and diarrhœa; other specific diseases.

DURATION AND TERMINATIONS.—The entire *duration* of an attack of hooping-cough is very variable, but from six to eight weeks is stated to be the average. The third stage may continue for an indefinite period; and a *relapse* is not uncommon. Most cases terminate in recovery, but death is not an uncommon event, being occasionally due to the severity of the disease, but usually to complications. Some permanent organic mischief often remains behind; or the chest may become deformed.

PROGNOSIS.—Hooping-cough is always a serious disease, and calls for a guarded prognosis. The general circumstances which increase its gravity are that the patient is very young, suffering from dentition, or the subject of constitutional debility; residence in a large town; poverty and its consequences; and epidemic prevalence. The complaint is more dangerous in proportion to the number and severity of the paroxysms; to the degree of pyrexia; and to the gravity of the complications present.

TREATMENT.—Numerous *specific remedies* have been brought forward for the treatment of hooping-cough, but they all fail in most cases, the disease running its course unchecked, though it may be mitigated in its severity. The chief indications are:—1. To prevent or subdue the paroxysms of cough, at the same time care being taken that there is no accumulation of secretion in the bronchial tubes. 2. To obviate all complications, and treat them as they arise. 3. To attend to the general health; and to the state of the various secretions.

It should be a constant rule, in the case of children, to pay immediate attention to any chest-symptoms, and this applies to the early period of hooping-cough. The patient should be kept in a warm room; be well-clad, with flannel next the skin: and have warm drinks, in order to promote perspiration. An aperient may be given; and a mixture containing *liquor ammoniæ acetatis* with *vinum ipecac.* should be administered.

In the *second stage* the most important remedies are *sedatives* and *antispasmodics*, for the purpose of allaying the paroxysms of cough. These must be given in minute doses, and their effects closely watched. The most efficient are *belladonna*, in the form of tincture, extract, or powdered leaves or root; *opium*, *syrup of poppies*, or *morphia; hydrocyanic acid; conium; hyoscyamus; tincture of lobelia; cannabis indica; ether; chloroform; valerian;* and *musk*. The *alkaline carbonates* are believed to be useful, and either of these may be combined with one of the above remedies. In my experience I have found most benefit from a mixture of *vinum ipecac.* and *hydrocyanic acid* (♏.¼ to ½); or from *tincture of belladonna*. Some advocate the employment of inhalations of *chloroform* or *ether*.

Of the various *specific remedies* advocated the chief are *alum* (which is in some cases decidedly valuable); *dilute mineral acids*, especially *nitric; cochineal; arsenic; nux vomica* or *strychnine; bromide of potassium* or *ammonium; infusion of clover;* and repeated *emetics*. The last are useful if there is any tendency to accumulation of secretion in the bronchi. *Metallic salts*, viz., those of *copper*, *zinc*, *iron*, and *silver*, have been recommended by various authorities, and may be useful in cases which tend to assume a chronic form. *Inhalations of carbolic acid* have also been advocated, and their use seems to have been attended with marked success in some instances.

Local applications have been tried, viz., touching the larynx with a strong solution of *nitrate of silver;* counter-irritation over the chest, or along the vagus nerve; friction over the chest with *opium*, *belladonna*, and other liniments; and the application of a *belladonna-plaster*. These measures are of doubtful benefit.

The *general management* of patients suffering from hooping-cough is important. In bad weather they should be confined to the house altogether, or even to one room, maintained at an uniform temperature; but, in favourable seasons, it is decidedly beneficial for them to be out in the fresh air during the warmer part of the day. The clothing must be sufficiently warm. It is important to attend to the diet, and to the state of the alimentary canal; should dentition be proceeding, the teeth must be looked to. Children who are sufficiently intelligent should be taught to suppress unnecessary cough as much as possible.

Complications must be watched for, and treated as soon as they arise. Inflammatory affections do not bear lowering measures well in hooping-cough, and supporting treatment is indicated in the majority of cases.

During *convalescence*, *tonic* remedies, especially *iron* and *quinine*, are useful. Change of air is also found to be highly beneficial in prolonged cases, or a sea-voyage. Good diet is needed, and a little wine is useful sometimes. There is no protection against hooping-cough, except in keeping away from the source of infection.

CHAPTER XVIII.

INFLUENZA—EPIDEMIC CATARRH.

ÆTIOLOGY.—Influenza is essentially an epidemic disease, and usually attacks a large number of persons, either simultaneously or in rapid succession. It often breaks out in several parts of a district at the same time. The epidemic generally progresses in a certain direction, and is said to have a cyclical course; frequently, however, it prevails over a very large area. The inhabitants of large towns are chiefly affected, especially of those parts which are low, damp, over-crowded, and in other unfavourable hygienic conditions. Sometimes the disease breaks out even at sea. It is very prone to modify the characters of other affections.

The *exciting cause* of influenza is believed to be a *specific poison*, which is conveyed only by the atmosphere. The nature of this poison is doubtful. Most authorities regard the complaint as being infectious; others consider it to be of malarial origin, and non-infectious. Inoculation cannot be effected in any way. Various hypotheses have been advanced to explain the occurrence of epidemics, but none of them are at all satisfactory. They break out at all seasons, but sudden changes of temperature are said to favour the development of the disease.

The chief individual *predisposing causes* are the female sex slightly; adult and advanced age; a low condition of the system; exposure to cold; and, it is said, the existence of chronic lung and heart diseases. The presence of any acute disease is believed to afford protection against influenza. One attack does not prevent another, and it has even been stated to render the individual more susceptible.

ANATOMICAL CHARACTERS.—The usual morbid appearances in influenza are those of catarrh of the mucous membrane, lining the nose and its communicating sinuses, the mouth, throat, and respiratory tract; and of the conjunctivæ. In severe cases capillary bronchitis, pulmonary congestion and œdema, or pneumonia may supervene, the inflammation often involving both lungs. Sometimes the lining membrane of the entire alimentary canal, and that of the genito-urinary apparatus, are affected. Occasionally pleurisy or pericarditis supervenes; or very rarely meningitis. There is no splenic enlargement.

SYMPTOMS.—Influenza is a disease running a specific and definite course; and characterized by pyrexia, with much constitutional disturbance, and local symptoms due to the implication of the mucous membranes. The *period of incubation* generally lasts from a few hours to five or six days, but may extend to two or three weeks.

The *general* symptoms usually precede the *local*, but not always. The *invasion* is often markedly sudden, but in other cases it is gradual. The early symptoms are chilliness, lassitude, pains in the limbs, and, in some cases, intense headache, or nausea and vomiting; followed by fever, which is usually high, the skin being very hot and dry, though sometimes there is much sour perspiration. At the same time the patient complains of a feeling of great prostration and debility, apathy, lowness of spirits, and mental inaptitude; with severe aching and shooting pains about the chest, back, limbs, and neck; headache, giddiness, and general restlessness. The pulse is at first frequent, full, and bounding, but soon tends to become soft, weak, and slow. The urine is febrile. The pyrexia generally presents evening exacerbations, and it is said to be in some districts intermittent. In uncomplicated cases the duration of the fever usually varies from four to eight days, being frequently terminated by *crisis*, accompanied with perspiration, abundant urine depositing lithates, or diarrhœa; but in other cases the pyrexia subsides gradually.

The *local* symptoms vary according to the seat and extent of the catarrh. Usually this begins in the nose and conjunctivæ, and spreads downwards. The nose feels hot and dry at first, and the eyelids smart. Soon a watery acrid discharge flows abundantly, and there is much sneezing, the sense of smell being impaired or lost; occasionally profuse epistaxis occurs. The mouth, tongue, and throat feel sore, and taste is defective. Severe pain is experienced across the forehead, owing to implication of the frontal sinuses. There may be pain along the Eustachian tube, with noises in the ears and some deafness. Examination reveals redness of those membranes which are visible; while herpes is often seen about the lips. The symptoms indicating implication of the air-passages are hoarseness; soreness and a tickling sensation along the larynx and trachea; more or less dyspnœa; oppression and stuffiness across the chest; paroxysmal cough, at first dry, but afterwards attended with bronchitic expectoration. These catarrhal symptoms usually subside from the fifth to the seventh day, the materials discharged undergoing the ordinary changes observed in the course of a catarrh. The tongue is furred, and there is much thirst, with loss of appetite. Gastro-enteric catarrh is evidenced by epigastric pain and tenderness; redness of the tongue; nausea or vomiting; and diarrhœa.

Cases of influenza differ much in their severity, and not unfrequently dangerous pulmonary complications arise, especially capillary bronchitis and pneumonia. The latter is apt to come on very insidiously, without any prominent symptoms. In these and other cases there is sometimes a tendency to adynamia, the tongue becoming brown and dry. Nervous symptoms are also occasionally prominent, viz., delirium, stupor, and convulsions.

DURATION AND TERMINATIONS.—Uncomplicated cases of influenza generally begin to convalesce from the fifth to the tenth day, but the duration may be much prolonged by *complications*. The great majority of cases end in recovery, but convalescence is often very tedious, and *sequelæ* are apt to remain, viz., great debility and nervous depression; neuralgic and rheumatic pains, which are common about the head and neck; or persistent cough. Occasionally chronic bronchitis, emphysema, chronic laryngitis, or phthisis is set up. Death is usually the result of lung-complications, but sometimes follows adynamic symptoms.

PROGNOSIS.—The circumstances which render an attack of influenza grave are very early or advanced age; a feeble constitution; the presence of chronic pulmonary or cardiac disease; serious lung-complications, with great dyspnœa, inability to expectorate, and signs of imperfect blood-æration; nervous disturbance; evidences of weak circulation; or adynamic symptoms. Some epidemics are much more fatal than others.

TREATMENT.—It has been satisfactorily proved that lowering treatment is injurious in influenza. In all cases it is advisable to keep the patient in-doors, in a cool, well-ventilated room, but protected from draughts. At the outset a *purgative* is useful, and in adults a dose of *calomel* seems to be beneficial, but repeated purgation is decidedly to be deprecated. Some recommend an *emetic* at the commencement, but such treatment is only indicated if there is much nausea. The *diet* must depend on the nature of the case; if it is slight, a moderate quantity of beef tea and milk may be allowed; but in severe cases, attended with much depression, a considerable amount of liquid nourishment is required. It is found that it is better to give things cool, and cold or iced drinks are very grateful, and may be freely allowed. Dr. Parkes recommended a highly diluted solution of *nitrate of potash* with *lemon-juice* and *sugar*. *Alcoholic stimulants* are not required at first, unless there is much debility, except in old persons, who generally need them early; in some instances large quantities of wine or brandy are called for, but they must be used cautiously. *Quinine* is a remedy which is usually well borne, and does much good; it is most valuable towards the decline of the disease, but may be given from the commencement.

The *catarrhal symptoms* are best relieved by inhalations of steam, to which some add *ether*, *chloroform*, or *conium*. Dr. Parkes suggested that direct *local applications* to the nasal mucous membrane and throat might be useful. For the bronchial catarrh *vinum ipecac.* in full doses answers best, and it may be combined with some sedative, such as *henbane* or *conium*, care being taken that there is no accumulation of secretion. *Opium* should only be employed with particular caution. Poultices, sinapisms, and warm or anodyne fomentations to the chest are often valuable. Should capillary bronchitis or pneumonia supervene, stimulant treatment is decidedly indicated, *ammonia* with *decoction of bark* and *chloric ether*, *camphor*, and such remedies being administered, as well as *alcoholic stimulants*. Free *dry-cupping* is often valuable in these cases. The patient must be encouraged to cough should there be extensive bronchitis, in order to get rid of the secretion, and if this accumulates an *emetic* must be given.

If the general pains are severe, *iodide of potassium* with *quinine* often gives relief. It may be necessary to administer *opium*, or to have recourse to subcutaneous injection of *morphia*. Some practitioners recommend the administration of *colchicum*. Pyrexia may be moderated by cold sponging. Cold to the head, or the apvomiting; followed by fever, which is usually high, the skin being very hot and dry, though sometimes there is much sour perspiration. At the same time the patient complains of a feeling of great prostration and debility, apathy, lowness of spirits, and mental inaptitude; with severe aching and shooting pains about the chest, back, limbs, and neck; headache, giddiness, and general restlessness. The pulse is at first frequent, full, and bounding, but soon tends to become soft, weak, and slow. The urine is febrile. The pyrexia generally presents evening exacerbations, and it is said to be in some districts intermittent. In uncomplicated cases the duration of the fever usually varies from four to eight days, being frequently terminated by *crisis*, accompanied with perspiration, abundant urine depositing lithates, or diarrhœa; but in other cases the pyrexia subsides gradually.

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If the general pains are severe, *iodide of potassium* with *quinine* often gives relief. It may be necessary to administer *opium*, or to have recourse to subcutaneous injection of *morphia*. Some practitioners recommend the administration of *colchicum*. Pyrexia may be moderated by cold sponging. Cold to the head, or the application of two or three leeches, might be necessary, should dangerous nervous symptoms arise.

During *convalescence* tonics are needed, especially *quinine* and *iron*, with nourishing food and wine or beer. Change of air is highly beneficial, and the patient must wear flannel, and guard against taking cold. *Expectorant* remedies are often required at this time, and excessive cough must be allayed by *opiates*.

CHAPTER XIX.

EPIDEMIC, ASIATIC, ALGIDE, OR MALIGNANT CHOLERA. —CHOLERA MORBUS.

ÆTIOLOGY.—Cholera is an *acute specific disease*, which chiefly prevails as a virulent epidemic, but in certain regions is endemic. The *exciting cause* is undoubtedly a *specific poison*, the nature of which is quite unknown, though it has been presumed to consist of certain microscopic living organisms and their germs, which have been described by different observers as being present in the excreta and blood. The careful researches of Drs. Lewis and Cunningham have, however, led them to conclude that cholera is not dependent upon any microscopically-demonstrable poison. It is unquestionably an infectious disease, and is capable of being transmitted from one human being to another, but there is abundant proof that the stools constitute the main, if not the only channel of contagion, and that the great cause of the propagation of cholera is the contamination of water used for drinking purposes with the excreta of persons suffering from this complaint. It has been found that the admixture of an extremely minute quantity of the specific stools will impart to great quantities of water the power of originating the disease, if taken into the alimentary canal. Probably the contagium becomes rapidly multiplied in the water, especially if this is exposed to the heat of the sun. Milk is also liable to convey the cholera poison, as in the case of typhoid fever, and possibly other articles of food may constitute the vehicle for its transmission. There does not seem to be any danger from merely being in the presence of those suffering from cholera, but emanations from the excreta into the atmosphere may generate the disease, being afterwards swallowed or inhaled, especially in places which are ill-ventilated.

The poison of cholera has been regarded by some as having a malarial origin, and they deny that the malady is infectious. Pettenkofer believes that the germs of the disease, after leaving the human body, develope and multiply in the subsoil moisture under the influence of heat, and then rise as a miasm into the atmosphere.

The immediate cause of a *cholera-epidemic* is often obscure and difficult to detect, but a more correct knowledge of the ætiology of the disease will probably in future clear up much of the obscurity on this matter. Many authorities maintain that cholera has been imported into Europe and other parts of the world from India, and Macnamara affirms that every outburst of the disease can be traced back through a series of cases to that country, it having been propagated by human agency, and always having followed the principal paths of human intercourse.

Certain conditions tend to promote the spread of cholera, and to aggravate its intensity, viz., a high temperature, with a moist, heavy, and stagnant atmosphere, cholera being therefore most prevalent in certain hot climates, and during hot seasons; a low position of a district; and unhealthy sanitary conditions, especially overcrowding, want of proper ventilation, accumulation of decomposing organic matter, from imperfect drainage or any other cause, and impure and unhealthy food or water. Many other conditions have been supposed to affect the prevalence of cholera, such as the nature of the soil, the electrical state of the air, or the amount of ozone present in the atmosphere; but the statements on these matters are extremely contradictory. It is found that most cases of cholera break out early in the morning.

Certain individual *predisposing causes* have been mentioned, but about many of these there is also much contradiction. Among the chief are fatigue, as after marching a long distance; destitution; errors in diet; abuse of purgatives; depressing mental influences, especially grief and fright; rather advanced age; race; intemperate habits; a bad state of health; certain occupations; and recent arrival in an infected district. One attack does not afford protection against another.

ANATOMICAL CHARACTERS.—The morbid appearances met with in the majority of cases of death from cholera may be thus summarized:—The temperature generally rises after death, and the body remains warm for some time. Rigor mortis sets in very speedily, there being often powerful muscular contractions, displacing and distorting the limbs. The skin is mottled, more or less livid or blue, especially in dependent parts, and the limbs are shrunken, but these appearances are less marked than before death. Some striking peculiarities as regards the distribution of the blood are usually observed. The left cavities of the heart are contracted and rigid, and almost or quite empty, as well as the arterial system generally; the right cavities are distended with blood, as are likewise the pulmonary artery and its divisions, and the systemic veins. The pulmonary capillaries and veins, however, contain little or no blood, while the lungs are more or less collapsed, in some cases being almost completely airless and bloodless. Occasionally there is some degree of hypostatic congestion. The condition just described is regarded by some observers as being highly important in a pathological point of view, but Macnamara affirms that it is frequently due to *post-mortem* change, the blood being forced by *post-mortem* rigidity out of the left ventricle and arteries into the capillary and venous systems; and that if the examination is made immediately after death, the left side of the heart will be found as full of blood as the right. Most of the organs of the body are not congested, but, on the other hand, they are shrunken and pale, their capillaries being empty, but the alimentary canal and kidneys are commonly more or less injected. The blood is frequently much altered in its physical and chemical characters, being thick, dark, and tarry-looking, becoming lighter, however, on exposure. Most observers affirm that it is deficient in coagulability. Ecchymoses are sometimes seen under mucous and serous membranes; while the endocardium, and the fluid contained in serous cavities, are often stained with hæmatine.

The *stomach* and *small intestines* generally present more or less injection of their mucous lining, that of the intestines being also somewhat thickened and œdematous. The bowels are distended, and contain a quantity of materials in the main similar to those discharged during life. They differ, however, in having an abundant admixture of detached epithelium, which is believed therefore to be shed after death. Sometimes there are masses of gelatinous or fibrinous matter, or much grumous blood. The glandular structures are commonly enlarged and prominent, especially Peyer's and the solitary glands, the latter in rare instances presenting ulceration. In exceptional cases a diphtheritic deposit has been observed. The *large intestines* are usually contracted, but do not exhibit any special characters. The *bladder* is contracted, sometimes extremely so, and its epithelium, as well as that of the urinary passages and vagina, may be shed profusely.

In cases which survive into the *reaction-stage*, there are more marked *post-mortem* appearances, indicating gastric and intestinal inflammation; acute Bright's disease; extreme congestion, low inflammation, or gangrene of the lungs; serous inflammations of a low type; or other complications to be hereafter mentioned: whilst those characteristic of cholera disappear more or less.

SYMPTOMS.—Cholera affords in typical cases a well-defined clinical history, which it is customary to divide into certain stages. The *period of incubation* is of uncertain duration, but it may range, according to different observers, from one to eighteen days. From two to four days is a common incubation-period (Squire).

1. *Premonitory stage.*—In many instances this stage is is not apparent, the disease manifesting itself suddenly in all its virulence. Diarrhœa is the most important premonitory symptom observed, which may or may not be attended with griping. Nervous disturbances have also been noticed sometimes, though many doubt their reality, such as a sense of languor, debility, exhaustion, or marked depression, trembling, altered expression of countenance, unaccountable lowness of spirits, headache, giddiness, noises in the ears, epigastric uneasiness and oppression, and various other symptoms. This stage is of short duration.

2. *Evacuation stage. Stage of Development.*—At this time the prominent symptoms are severe purging and vomiting, the materials discharged having special characters; constant thirst; painful cramps; with signs of marked general disturbance, in the direction of prostration and collapse, combined with great restlessness. The *purging* is the first symptom, and it often sets in early in the morning, becoming speedily very frequent or almost constant,

being followed by a sense of much exhaustion, and of sinking at the epigastrium. The stools are very profuse, watery, at first coloured by the previous intestinal contents, but soon presenting peculiar characters, and being named "rice-water" stools, from their resemblance to water in which rice has been boiled. At this time they are perfectly liquid, exceedingly pale, somewhat opalescent or occasionally whitish or milky, having but little odour. When this liquid is allowed to stand, more or less sediment falls, resembling flakes of boiled rice, leaving a whey-like fluid above, which has a specific gravity of from 1005 to 1010, and a neutral or slightly alkaline reaction. The quantity of deposit is actually very small, Dr. Parkes having found the amount deposited from a pint not to weigh when dried more than 4 grains. Chemically the evacuations consist mainly of water, holding in solution a considerable proportion of salts of soda and potash, especially chloride of sodium, with but very little albumen or other organic matter. The sediment has been supposed to be modified fibrin or mucus. Microscopically the objects which have been described are abundant granules; active amœbiform particles of bioplasm; nuclei; round, nucleated, and granular cells, resembling pus or exudation cells; peculiar hyaline cells; a few epithelium particles; fungi, bacteria, vibrios; and occasionally triple phosphates. In exceptional cases blood or its colouring matter is discharged. Often the diarrhœa is painless, but there may be griping, and a burning sensation at the pit of the stomach is frequently experienced. *Vomiting* comes on later, and is less severe and profuse, occurring chiefly after anything is taken. The vomited matters, which are often expelled with much force, at first consist of the previous stomach-contents, but soon assume the characters of a clear, colourless or yellow, thin fluid, mixed with mucus and disintegrated epithelium. The *cramps* usually set in at the same time as the rice-water stools appear, affecting mainly the fingers and toes, calves of the legs, and thighs, but sometimes the abdominal muscles also suffer. *Thirst* soon becomes a distressing symptom.

In proportion to the severity of the purging and vomiting, a sense of exhaustion is felt, and signs of depression and collapse appear, culminating, if the symptoms do not subside, in those characteristic of the next stage, under which they may be more conveniently described.

3. *Stage of collapse. Algide stage.*—There is no abrupt commencement of this stage, but a more or less rapid transition from the former. The *aspect of the patient* becomes highly characteristic. The features are pinched and shrunken, assuming a leaden or livid hue, especially about the lips; the eyeballs sink in their sockets, while the lower eyelids fall, and the eyes are half closed; the nose becomes sharp and pointed; and the cheeks are hollowed. The entire surface of the body is more or less cyanotic, but especially that of the extremities, while the skin presents a peculiar wrinkled and shrivelled aspect, being often at the same time bathed in cold sweats, the hands appearing sodden like those of a washerwoman. When the skin is pinched up the folds disappear slowly. The

temperature rapidly falls, and the surface soon assumes a death-like coldness, particularly over exposed parts, though it is stated that the temperature within the body is usually increased. In the mouth it ranges from 79° to 88°, in the axilla from 90° to 97° (Goodeve). In the vagina and rectum it is considerably higher. The *circulatory organs* and *blood* afford evidences of grave disturbance. The radial pulse is exceedingly feeble and thready, or even extinct, and in bad cases no pulsation can be felt in the brachial, or even in the carotid arteries, while the cardiac impulse and sounds become extremely weak or almost imperceptible. The general capillary circulation is seriously embarrassed. When a vein is opened, little or no blood escapes, this being thick, viscid, and tar-like. The *respiratory functions* are also impeded. There is paroxysmal dyspnœa, accompanied with gasping for breath, and a sense of oppression and craving for air, at last becoming almost continuous. The expired air is cold and very deficient in carbonic anhydride. The voice is extremely weak, often whispering or entirely inaudible. The *nervous system* necessarily suffers severely. As a rule muscular prostration is marked, but the strength is now and then wonderfully retained. There is great restlessness and jactitation, with wakefulness, the patient tossing about and throwing off the bed-clothes. At first much anxiety is felt, but this soon changes into apathy and indifference. Occasionally headache, giddiness, tinnitus aurium, muscæ volitantes, or cloudiness of vision are complained of. The mind is for a time clear though inactive, but in cases ending fatally stupor sets in, followed by coma. Reflex excitability is markedly impaired. Cramps continue from time to time.

A prominent feature of this stage is the *impairment* or *complete cessation* of the functions of *absorption* and *secretion*. No saliva is formed; while the urine is almost entirely or quite suppressed. At this time the purging and vomiting diminish in amount and frequency, though there may be much retching; the stools are less liquid usually, and contain mucus or gelatinous masses; they are often passed in bed. Ultimately they may become extremely offensive, the smell resembling that of decomposed fish. Intense thirst is experienced, with a sense of heat in the epigastrium, the patient constantly craving for cold drinks, which are swallowed with spasmodic avidity, probably to be immediately rejected. The tongue feels cold.

The intensity of the symptoms just described varies much. When they are developed in their full severity, recovery seldom takes place, death occurring more or less speedily, being preceded by signs of more and more interference with the respiratory functions, increased capillary stagnation, and coma. In most cases the temperature rises with the approach of death. In the less marked cases, however, recovery follows not unfrequently, and there is no condition which is utterly hopeless. The phenomena attending restoration will now be considered.

4. *Stage of Reaction.*—The prominent signs indicating restoration are a gradual change in the expression, general aspect, and

colour; improvement in the pulse and cardiac action, with diminution in the capillary stasis; and return of heat to the surface. Breathing becomes at the same time more regular and calm; while the restlessness, thirst, and other symptoms abate; and the secretions are re-established. The patient often falls into a calm doze; vomiting ceases, but a little purging may continue, the stools, however, containing bile. There is said to be no actual rise of temperature at the beginning of reaction, but a cooling of the interior parts of the body while the outer parts warm up (Jüterbogk). This stage may terminate in speedy convalescence, but such is often not the case, certain *complications* or *sequelæ* being very liable to supervene, or now and then a *relapse* taking place, which may prove fatal. Occasionally also the reaction is imperfect, and the symptoms continue to a greater or less degree, there being no pyrexia, and the patient dying in a few days, or sinking into a typhoid state, or ultimately making slow progress towards recovery. A most important matter during the progress of convalescence is to look for the re-establishment of the secretory functions, especially as evidenced by an increase in the quantity of urine. The temperature not unfrequently rises above the normal without any obvious cause.

COMPLICATIONS AND SEQUELÆ.—Among the less important *complications* and *sequelæ* mentioned by Dr. Goodeve are mild consecutive fever, with general disturbance, which may assume a remittent or intermittent type, usually ending in recovery in a few days; obstinate vomiting, often associated with more or less gastritis, which may become very serious; frequent hiccup, with gaseous eructations, and loss of appetite; and want of sleep. The more grave *complications* usually met with are acute desquamative nephritis with signs of uræmia, the renal disease sometimes becoming chronic; "cholera typhoid;" severe enteritis, occasionally of a diphtheritic character; chronic diarrhœa or dysentery; low pneumonia or pleurisy. The urine is usually albuminous, and may contain some hyaline casts during convalescence, but in favourable cases it soon becomes normal. In some instances, however, it assumes the characters indicative of acute renal disease, while other symptoms of this condition appear, along with signs of uræmia. The term *cholera typhoid* has been used vaguely; the symptoms are merely those pertaining to the *typhoid state* generally, and they may be associated with uræmia, or with any adynamic inflammation; or they are sometimes independent of obvious morbid changes, being then probably due to blood-poisoning. The temperature rises should inflammatory complications set in.

A *cholera eruption* or *exanthem* has been described, but though erythematous, maculated, papular, urticarial, or even purpuric eruptions appear in some instances, there is none characteristic of cholera.

As occasional *sequelæ* are mentioned inflammation of the genitals; parotid bubo; ulceration of the cornea and its consequences; gangrene of various parts; and the formation of bed-sores, boils, or ulcers. In many cases, especially if the illness has been prolonged, a condition of marked debility and anæmia remains behind.

VARIETIES.—In some cases the *collapse-stage* sets in after little or no previous purging or vomiting, death ensuing very speedily. On the other hand this stage may be imperfectly developed. During an epidemic of cholera numerous cases of diarrhœa are met with, lasting several days, and generally unattended with pain, to which the terms *choleraic diarrhœa* or *cholerine** are applied. The stools are usually pale, liquid, and copious; and there may be vomiting and cramps; while the patient feels much exhausted and seriously ill. These cases have been regarded as the result of a milder dose of the cholera poison, and they may pass into true cholera, though sometimes they prove fatal independently of this. Towards the end of some epidemics the choleraic diarrhœa passes into a kind of low fever.

Here also may be mentioned the so-called *sporadic*, *bilious*, or *English cholera*, or *summer diarrhœa*, the symptoms of which sometimes closely resemble those of true cholera. Ordinarily they are less severe; the stools and vomited matters contain bile; there is more griping; urine is not entirely suppressed; the duration is longer; while the mortality is much less (Goodeve). Some cause, such as an error in diet, can generally be found for the attack.

PATHOLOGY.—All authorities seem agreed that cholera is primarily due to the action of some *specific morbid poison* upon the system, the nature of which is at present doubtful. Beyond this point there are wide divergencies of opinion. Dr. G. Johnson and others consider that all the phenomena of cholera are directly due to this poison, which acts first on the blood, in which it is enormously multiplied, and then affects certain portions of the nervous system, especially the sympathetic and the nerve-centres influencing the respiratory and circulatory organs, thus leading to paralysis of the coats of the intestinal smaller arteries and capillaries, with consequent free transudation, while the small vessels of the lungs are spasmodically contracted, and will not allow the blood to pass through these organs. According to this view the purging and vomiting are regarded as *eliminatory* of a morbid poison. Another class of pathologists believe that the cholera-poison acts primarily and immediately on the alimentary canal, and that the subsequent phenomena of collapse are the consequence of the intestinal disease, and of the violent purging and vomiting accompanying it, being due to the physical changes in the blood, and the disturbance of the sympathetic nervous system thus induced. The blood does undergo some very marked alterations. As already stated, it becomes very thick and dark. Water is rapidly withdrawn, both from the liquor sanguinis and from the corpuscles, and hence a serious disturbance arises in the relations of these constituents to each other. Soon also the proportion of saline ingredients is much diminished, while that of the organic elements is relatively increased, especially the corpuscles and albumen. The specific gravity is considerably raised. Occasionally the blood is acid. During the *collapse-stage* it may contain urea and other products of decomposition, some of which may originate in changes in the stagnant blood itself. In the *reaction-stage* these materials are often very abundant. Drs. Lewis and Cunningham have described peculiar microscopic changes observed in choleraic blood removed during life, as well as in that obtained after death, viz., the rapid development and multiplication of active bioplastic bodies, ultimately forming cells; and they consider that these changes may go on in the body, and that this may account for the abundant bioplasts and cells found in the cholera evacuations. The alterations in the blood will explain the thirst, and the drying up and shrivelling of the tissues; as well as to a great degree the capillary stagnation, the disturbance of the respiratory and circulatory functions, and the suppression of secretions. At the same time these phenomena are partly to be accounted for by the influence exerted upon the heart through the sympathetic, the feeble action of this organ aiding in producing many of the symptoms, because it cannot drive the blood through the vessels. The dyspnœa is also to some extent due to the pulmonary collapse. The cyanotic appearance is partly the result of the stagnation of blood; partly of its concentrated and venous character.

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* The term *cholerine* has also been applied by Dr. W. Farr to the poison which originates cholera.

It is important to note that the fact of purging ceasing during the collapse-period does not always imply that fluid has ceased to transude, for at this time the intestines are often paralyzed, and may contain a large quantity of fluid which they are unable to expel.

The phenomena which characterize the *reaction-stage* are due chiefly to the impurities which accumulate in the blood, and they are more liable to arise in proportion to the duration of the collapse-stage, and to the length of time which elapses before secretion is properly established after reaction has commenced. These phenomena are probably promoted in some cases by improper employment of stimulants and drugs.

Prognosis—Mortality—Duration.—It need scarcely be remarked that the prognosis in cholera is always very grave. The *mortality* varies in different epidemics, ranging from 20 or 30 to 70 or 80 per cent.; it is higher in the early part of an epidemic. On an average more than half the cases recover. The chief general circumstances rendering the prognosis worse are infirmity and old age; unfavourable hygienic conditions; previous intemperance; debility from any cause; or the existence of renal disease. During the actual attack the prognosis, both immediate and remote, is more grave in proportion to the rapidity with which signs of collapse set n; and to their intensity and duration. Rapid cessation of pul- ation in the larger arteries; great disturbance of the respira- ory functions; a striking fall in temperature; marked cyanosis; r a tendency to coma, are all very bad signs. The cessation of urging is sometimes unfavourable, indicating paralysis of the in- stines. When reaction sets in, there are many dangers to be ared, but a more favourable progress towards convalescence is to e expected in proportion to the rapidity with which the functions f secretion and absorption are re-established, and to the continuous and regular improvement in the symptoms. Most of the subsequent *complications* or *sequelæ* are exceedingly serious.

The *duration* of cases of cholera may range from a couple of hours to some weeks, reckoning in its sequelæ. The average duration of fatal cases is about from two to three days. The length of each stage varies considerably.

TREATMENT.—The *preventive treatment* of cholera is extremely important, and calls first for consideration. During an epidemic of this disease all the rules laid down in a former chapter, relating to the management of contagious diseases and epidemics, must be rigidly carried out, under the personal superintendence of competent individuals. *Cleanliness* and *free ventilation* are highly important. Particular attention is demanded with regard to the *choleraic stools*, which should be immediately disinfected, and so disposed of that there will be no danger of their becoming mixed with drinking water, care being taken that the sewers and drains are kept in good order, and that they are well flushed with disinfectants from time to time. On no account must the excreta be recklessly thrown out on the ground, and, if there is no proper place to receive them, they should be buried a considerable depth in the earth, away from all habitations. Most important is it to attend to the water-supply, and to see that the water used is abundant and pure. It should always be filtered. Food must also be looked to, and especially milk. Persons should be warned against errors in diet, intemperance, and other injurious influences; while everything must be done to calm the minds of those inhabiting an infected district, and to prevent needless fear and depression. During an epidemic of cholera it is very properly the custom to organize staffs of medical men and their assistants, in order to carry out thoroughly all the necessary preventive measures, and to treat cases as soon as they arise, house-to-house visitation being practised daily. It is highly desirable that all persons who are able to do so should remove from infected districts.

With regard to the disposal of the dead, the bodies should be buried as soon as possible, each being surrounded in its coffin with some disinfectant, such as a mixture of *charcoal*, *lime*, and *carbolic acid*. An apartment which has been occupied by a cholera-patient must be thoroughly disinfected and cleansed, and it is often necessary to destroy clothing and bedding.

The *curative treatment* of cholera is unfortunately in many cases quite hopeless, but often much may be done, particularly at an early period of the complaint. It is a great mistake to follow a routine plan in all cases, but the practitioner should be guided as to the measures to be employed by the actual condition of the patient, and the stage of the disease. Personal supervision on the part of the medical attendant is desirable, so far as this is practicable, in order to see that the treatment is properly carried out. The earlier this treatment is commenced the more likely is it to be successful, and patients should take to their bed at once. During a cholera-epidemic, the slightest case of diarrhœa ought to receive the most prompt attention, and the public should be instructed on this point, places being established where they may at once obtain the necessary medicines.

In the *evacuation-stage* two directly contrary plans of treatment have been employed, most practitioners using measures for checking the diarrhœa; a few encouraging it, acting on the principle that it is eliminatory of a poison. Dr. G. Johnson gives *castor oil* at frequent intervals. Others have advocated the use of *calomel*, *sulphate of magnesia*, and other *purgatives*. Undoubtedly in some cases of early choleraic diarrhœa a dose of *castor oil* is beneficial, with the view of getting rid of irritant matters; but, apart from all theoretical considerations, experience has proved that the systematic employment of this plan of treatment is by no means attended with favourable results. Most decidedly the evacuations ought to be checked as soon as possible, in my opinion. *Opium* is the great remedy for this purpose, the best preparations being the *pill*, *tincture*, *liquor opii sedativus*, or *Dover's powder*, the liquid preparations answering best if there is much vomiting, or if speedy absorption is required. This drug, however, requires much care in its employment in cholera. Should there be signs that the collapse-stage is approaching, particular caution is necessary in administering *opium*, while it is inadmissible if this stage has become established. If the indications are favourable, it seems best to give a full dose at once, and subsequently to repeat it in small quantities as it is needed. Should the first dose be vomited, it must be repeated after a short interval. Various *astringents* are also useful, especially *acetate of lead*, (gr. ij—iij); *tannic* or *gallic acid*, (gr. x—xx); and *dilute sulphuric acid*. Some prefer giving *opium* by itself, and administering the remedies just mentioned between times; others combine them with *opium*. The experience of some cases seems to indicate that the encouragement of very free sweating at the commencement of an attack of cholera may prove beneficial.

In the *collapse-stage* opium must on no account be given, but if purging continues, one of the astringents mentioned above may be employed. At this time most reliance is to be placed on the judicious use of *stimulants*. Before early indications of collapse appear, stimulants are not called for, but as soon as any weakness of the pulse is observed, or other signs of sinking, their administration should be commenced. The practice of pouring in large quantities of alcoholic stimulants is to be highly deprecated, and their employment needs the most careful regulation. The most serviceable are brandy with iced water, and champagne. They must be given in small quantities; at more or less frequent intervals according to circumstances; and their administration must be mainly guided by their influence upon the pulse. If the purging has ceased, brandy may be given in enemata with beef-tea. Diffusible stimulants are also of service in this stage, such as *aromatic spirits*, *solution*, or *carbonate of ammonia*; the various *ethers*; *camphor*, which has been vaunted as a specific; *musk*, and similar remedies. These may be combined with *essential oil of peppermint*, *cinnamon*, or *cajeput*. Niemeyer found a few cups of hot strong *coffee* useful in many cases.

With regard to *diet*, it is useless to give any nourishment at the commencement, as this is only rejected immediately. A little beef-tea, chicken-broth, or arrow-root and milk may be tried at a later period, if the vomiting ceases. The patient should be allowed an unlimited supply of ice to suck throughout, which Macnamara considers invaluable in the treatment of cholera, but he lays great stress on prohibiting every kind of drink until the collapse-stage sets in, when iced-water in moderation may be permitted. *Enemata* of *iced-water;* or, on the other hand, those of *warm milk* have been recommended.

Local measures are often of much service for the relief of symptoms. A large mustard poultice should be applied at once over the abdomen, and repeated as required. For the relief of the cramps, hot-bottles, sinapisms, and friction, either with the hand alone, or with *turpentine* or *chloroform liniment*, may be employed. If they are very severe, inhalation of *chloroform* is admissible. In the collapse-stage Niemeyer recommended the application of cold compresses over the abdomen.

Should *reaction* set in, the utmost care must be exercised, and the natural progress towards convalescence must not be interfered with by needless medication. The diet needs particular attention at this time, only the blandest liquid food being allowed in moderate quantities, and this regulation of food is demanded until the patient has been entirely restored, it being improved gradually as the stools become natural. Water may be freely allowed during this stage, and it has been recommended to dissolve some *chloride of sodium* and *carbonate of soda* in it, in order to replace the loss of these salts. It is highly important to watch for the re-establishment of the secretions, and, if necessary, measures may be adopted to encourage this. *Complications* and *sequelæ* must be treated as they arise. It need only be mentioned here that it is always desirable to check diarrhœa at this time, should the stools be very offensive; and that inflammatory affections require a supporting treatment. *Tonics* and *iron* are often serviceable during convalescence.

It is important to pay strict attention to the *cleanliness* and *ventilation* of the sick room; and to see to the *immediate removal* and *disinfection* of wet and soiled bed-clothes, it being advisable also to have a mackintosh placed under the patient. Due precautions must be taken against bed-sores, frequent examination of parts pressed upon being made. Should the urine be retained, the bladder must be emptied by means of the catheter; if it is suppressed, hot applications over the loins, and dry-cupping are indicated.

For such a disease as cholera it is not to be wondered at that innumerable *specific* modes of treatment have been advocated, but all have proved equally inefficient. Without making any comment, I merely mention some of the most prominent: viz., the administration of *saline salts*, chiefly *carbonates* and *chlorides*, either freely by the mouth, by enema, or by injection of a warm solution into the veins; the use of *warm*, *vapour*, or *hot-air baths*, or of the *wet sheet;* application of *ice to the spine;* the employment of *antiseptics*, such as *carbolic acid, sulpho-carbolates, chloralum, &c.*; *inhalation of oxygen*; *inhalation of nitrate of amyl;* the administration of *calomel*, gr. i—ij, at frequent intervals; or *bisulphide of mercury*. Recently *salicine* and *salicylic acid* have been recommended. The various *cholera-drops* and *pills*, which are held in repute in different countries, are made up of stimulants, generally combined with some preparation of *opium*.

Chapter XX.

GLANDERS AND FARCY—EQUINIA.

Ætiology.—These affections, which are occasionally observed in man, are transmitted from the horse, ass, or mule. It is doubtful whether they are distinct diseases, or varieties of the same malady. They are produced by the inoculation or contact of a *specific poison*, which is contained chiefly in certain discharges, but also in the excretions, secretions, and blood; and they are rarely met with except among those whose occupation brings them much into contact with horses, such as ostlers and grooms.

Glanders may be propagated in consequence of a horse snorting, and thus expelling a quantity of the discharge from the nostrils on to an individual, or into the surrounding air, from which it is afterwards inhaled. The poison may be conveyed by fomites to which the discharges become attached. It is even said that glanders may arise from breathing the atmosphere of a stable inhabited by glandered horses. These diseases can be re-transmitted to the horse and ass, as has been proved experimentally, and there is reason to believe that they are capable of being communicated from one human being to another.

Anatomical Characters.—Glanders and farcy are characterized by certain peculiar morbid changes. In the former, hard nodules form in connection with the mucous membrane of the nose, mouth, throat, and respiratory passages; as well as in the lymphatic glands, skin, subcutaneous tissue, muscles, lungs, and other organs. These are made up of cells, the result of proliferation, which soon degenerate, the nodules rapidly becoming soft and breaking down, forming abcesses and ulcers. The Schneiderian membrane is inflamed, and presents little pustular elevations or patches, which finally break out into excavated ulcers, and may lead to necrosis of the cartilages and bones, with perforation of the septum. The frontal sinuses may contain a puriform fluid. The larynx, trachea, and bronchi are also frequently affected. The lungs present pneumonic patches or abscesses. Small yellow elevations may be seen on the pleuræ, with fibrinous deposits underneath. The lymphatic glands are enlarged, softened, and reddish. Superficial petechiæ, ecchymoses, or gangrene are sometimes observed, or there may be suppuration or gangrene of the subcutaneous tissues, or of the substance of the muscles. A peculiar eruption appears on the skin.

Farcy differs from glanders in that the nasal mucous membrane is not affected, but so-called *tubercles*, *buds*, or *tumours* form in connection with the skin, which break down into deep, unhealthy ulcers; or the lymphatic system may be chiefly involved.

The appearances differ considerably, according as these diseases run an acute or chronic course.

SYMPTOMS.—1. *Acute Glanders.* The *period of incubation* is usually from three to eight days. After inoculation local signs of inflammation appear first as a rule, the neighbouring lymphatics being also affected. Ordinarily the disease is ushered in by such general symptoms as rigors, languor, pains in the limbs and joints, headache, often vomiting and diarrhœa, with a certain degree of pyrexia. Soon subcutaneous formations are noticed, especially on the face and near the joints, which quickly change into abscesses containing unhealthy and fœtid pus. Over these the skin becomes red or violet, and sometimes limited gangrene sets in. Usually a peculiar cutaneous eruption appears, especially on the cheeks, arms, and thighs. It begins in the form of small, intensely red spots, which soon become papular, and afterwards pustular. This eruption is not due to any exudation under the cuticle, but to circumscribed destruction of the true skin. Dark bullæ often appear also on the face, trunk, fingers or toes, and organs of generation, followed by gangrene. Erysipelatous inflammation of the nose, eyes, and surrounding parts is not uncommonly observed, which may extend to the scalp. The eruption is preceded and accompanied by profuse fœtid sweats.

A prominent symptom of glanders is a discharge from the nose, at first thin and scanty, but soon becoming abundant, purulent, viscid, extremely fœtid, and often sanious. It clogs the nostrils and obstructs breathing, while it escapes through the posterior nares, causing much distress and irritation. A thick matter also comes from between the eyelids, and sometimes from the mouth, which is then the seat of ulceration and pustules. The submaxillary lymphatic glands may be enlarged.

The constitutional symptoms increase in severity as the case progresses, being more or less a typhoid character, and indicative of septicœmia. Thus there is marked prostration, with a brown and dry tongue, and a very rapid, feeble, and irregular pulse. Diarrhœa and tympanitis are frequent symptoms, the stools being exceedingly fœtid, and sometimes bloody. There is also dyspnœa, with hurried breathing, hard cough with but little expectoration weak voice, and foul breath. Delirium and coma ultimately set in and death terminates the scene, in most cases at the end of the second or beginning of the third week, but it may happen much earlier or later than this.

2. *Chronic Glanders.* This variety is very rarely met with, and is usually a sequel of farcy. Its chief symptoms are lassitude and articular pains; sore-throat; disagreeable or painful sensations in the nose, with more or less puriform and bloody discharge; cough with expectoration, dyspnœa, and altered voice. After a time ulceration may be observed on the mucous membrane of the nose, followed by caries or perforation. The pharynx may also be ulcer-

ated. There is no eruption. The general symptoms are less marked than in the acute form, but the latter may supervene. The duration of chronic glanders is very variable.

3. *Acute Farcy.* The great difference between this affection and glanders lies in the want of implication of the nares. In one class of cases the eruption is present; in another there is no eruption, but merely inflammation of the lymphatic glands and vessels, with soft tumours under the skin, named *farcy buttons* and *farcy buds.* The former are by far the more serious.

4. *Chronic Farcy.* After constitutional symptoms, subcutaneous tumours form, which become abscesses, and these discharge their contents, leaving foul, deep, and indolent ulcers. As a consequence there is wasting, with great debility. The complaint may end in true glanders; or death may result from exhaustion or pyæmia. Occasionally recovery takes place. The duration is very variable.

5. *Equinia Mitis.* An affection is thus named which is derived by contagion from horses suffering from the "*grease.*" The symptoms are fever, depression, and shivering; with a pustular eruption, which dries up into scabs, and these fall off, leaving distinct scars.

Prognosis in all these affections is very grave, for they almost always prove fatal. *Chronic farcy* may terminate in recovery.

Treatment.—The most important matter is to exercise due precautions for the prevention of these diseases. If inoculation should happen, the affected spot must be immediately destroyed by some escharotic. A *supporting*, *stimulating*, and *tonic* plan of treatment is the only one which offers any chance of success in dealing with either of these affections; at the same time strict attention being paid to *cleanliness* and other *hygienic conditions.* Abscesses may be opened as they arise. *Antiseptics* internally might, perhaps, be of service.

Malignant Pustule—Charbon.

Ætiology.—In this country malignant pustule is of extremely rare occurrence in the human being. It is a disease which is transmitted to man mainly from sheep and oxen, these, as well as horses and other animals, being liable to the malady, under the names of "joint murrain," "black quarter," &c. The poison is usually conveyed by direct inoculation, the matter being brought in some way or other into contact with an abraded or wounded surface; but there is reason to believe that it may be absorbed by the unbroken skin in parts where this is very thin. Flies and other insects have been supposed to be instrumental in carrying the poison from affected animals to human beings. It is also probable that this complaint may arise from eating the flesh of cattle suffering from it. The large majority of cases have been met with in healthy adult males.

Symptoms.—Almost always some exposed part is inoculated, often the lip or some other part of the face, and at this spot the local signs of malignant pustule are first perceived. There is at the outset a little redness here, like that produced by the bite of a gnat, but very soon a small vesicle forms, attended with much itching or stinging, causing the patient to scratch. In a short time the tissues around rapidly swell and become hard, brawny, and discoloured, until ultimately the affected part assumes a black and gangrenous appearance. A surrounding erysipelatous areola is observed, upon which secondary vesicles form ; while the absorbent vessels and glands in the vicinity become inflamed. A fœtid odour arises, and if the lip is affected, saliva escapes in abundance, and the breath is extremely fœtid. Soon general symptoms indicative of blood-poisoning set in, viz., great prostration, cold clammy sweats, very weak and rapid pulse, hurried respiration, low delirium and other nervous phenomena. The great majority of cases of malignant pustule terminate fatally.

PROGNOSIS is necessarily very grave, but recovery occasionally takes place, if energetic treatment is carried out at an early period.

TREATMENT.—As early as possible the affected spot should be incised, and effectually cauterized by means of *potassa fusa* or the *actual cautery*. Some *disinfectant application* should afterwards be used, such as a solution of *carbolic acid*. The patient must be kept in a well-ventilated apartment, and have abundant nourishment, with alcoholic stimulants. *Quinine*, *tincture of steel*, and *mineral acids* are the most reliable internal remedies. A solution of *chlorate of potash* may be employed as a drink. *Antiseptics* might be administered at the same time.

CHAPTER XXI.

HYDROPHOBIA—RABIES.

ÆTIOLOGY.—Hydrophobia is unquestionably a *specific contagious disease*, resulting from the action of a *specific poison* of unknown nature, which in the human being is almost invariably introduced into the system through the bite of a mad dog inflicted upon some exposed part of the skin, but is in rare instances transmitted from other allied animals, as the cat, wolf, or fox. Only a small proportion, however, of those bitten by dogs actually suffering from rabies take the disease. It may be conveyed in consequence of a dog merely licking an exposed surface; and it has even been supposed that the poison may be absorbed by the entire skin, where this is thin. The contagium is contained mainly in the saliva or buccal secretion. Some affirm that the disease can be transmitted from man to man. Mental anxiety has been presumed to predispose to hydrophobia, but there is no reliable evidence of this.

ANATOMICAL CHARACTERS and PATHOLOGY—There are no absolutely characteristic morbid appearances associated with hydrophobia. The most important changes which have been observed in connection with the brain and spinal cord, viz. :—congestion of the meninges, with coagula in the venous sinuses; excess of fluid in the ventricles; effusion of blood and serum around the upper part of the cord, with small extravasations of blood into its substance. There may be increased vascularity of the fauces, and occasionally a deposit of lymph is observed here. *Post-mortem* congestion of dependent parts is common.

It is supposed that the poison of rabies undergoes a kind of fermentation, and becomes increased both at the wound and in the system. It then acts upon the blood, and subsequently is presumed to affect the eighth pair of nerves and the medulla oblongata, which will account for the phenomena observed.

SYMPTOMS.—A very indefinite *period of incubation* intervenes between the introduction of the poison, and the development of the symptoms of hydrophobia. About forty days is said to be the average, but it may vary from fifteen days to many months, or, it is said, even years. In some cases unusual objective appearances or subjective sensations are developed in connection with the cicatrix of the bite before the symptoms break out, such as redness, itching, &c.

When the disease begins to declare itself, the patient feels uncomfortable, low-spirited, despondent, and restless; has an undefined feeling of anxiety or dread; and complains of giddiness, or of alternate chills and heats. Then follows a sense of oppression in the chest, with involuntary deep sighing inspirations from time to time; or a sudden catch in the breathing may first occur, attended with severe pains in the epigastrium, due to spasm of the diaphragm. The subsequent characteristic symptoms are grouped by Mr. Erichsen as:—1. Spasmodic affection of the muscles of deglutition and respiration. 2. Extreme sensibility of the surface and of the special senses. 3. Excessive mental terror and agitation. The nature of the malady is generally revealed to the patient by a fit of choking brought on by an attempt to drink, and by finding that swallowing has become difficult or impossible. This condition becomes rapidly worse and worse, each attempt at drinking bringing on a spasm of the muscles of deglutition and respiration, which is attended with a feeling of intense oppression and suffocation, causing great distress. Not unfrequently solids can be swallowed at first without producing any disturbance. Soon the sight or sound of any liquid, or anything that even suggests the idea of drinking, brings on the spasmodic attacks, while the patient spits out the viscid secretion which forms in abundance in the mouth as fast as it is produced, so as not to be tempted to swallow it. Soon the skin and special senses become extremely sensitive, so that the least touch or a sudden sound or light will bring on the spasms, which ultimately extend to other muscles, assuming more or less characters of general convulsions. The patient is in a state of great terror, anxiety, and depression, combined with restlessness. Often fits of furious mania subsequently occur, in which the patient is extremely dangerous and utters strange sounds, which has given rise to the idea of barking being a symptom of this disease. In the intervals the intellect is generally quite clear. Sometimes there are curious persistent delusions. As the case progresses towards a fatal termination, which is the invariable result, the special symptoms diminish or may even disappear altogether, and the patient gradually sinks from exhaustion and collapse. In rare instances death occurs suddenly, from suffocation during a fit of spasm. The duration of the disease is from three to five or six days.

TREATMENT.—The most important indication is to *prevent* hydrophobia, by immediately cauterizing the part bitten by means of *nitrate of silver*, the *hot iron*, or *potassa fusa;* or by complete *excision.* Other modes of preventive treatment are quite useless. The patient's mind should be calmed as much as possible, and he should be prevented from brooding over his danger. There is no remedy that I am acquainted with of any real service for the cure of hydrophobia, once the disease has become developed. Relief might be afforded by *sub-cutaneous injection* of *morphia*, *atropine*, or *curara;* the application of the *ice-bag to the spine;* and *inhalation of chloroform.*

CHAPTER XXII.

DENGUE—DANDY FEVER—BREAKBONE FEVER.

ÆTIOLOGY.—Dengue is a peculiar epidemic fever which attacks a great number of people in rapid succession. It is not met with in this country, but prevails in America, the East and West Indies, and other parts. It is not known what the actual cause is; some believe it to be a contagious complaint, but the evidence on this point is insufficient and unsatisfactory.

SYMPTOMS.—After an *incubation-period* of from twenty-four hours to ten days, the invasion is usually somewhat sudden, the symptoms being chilliness, a sense of debility and uneasiness, with violent pains in the muscles of the limbs and back, as well as in a variable number of joints, which are somewhat swollen. There is also headache, and the alimentary canal is often disturbed, but the tongue remains clean. At first the symptoms very much resemble those of rheumatism. In a short time fever sets in, and sometimes a rash or papular eruption appears. The lymphatic glands and testicles may be painful and enlarged. In from twelve hours to three or four days the symptoms subside, but debility remains, with some painful sensations. After an interval of two, three, or four days the fever and pains return, or severe headache sets in. The tongue becomes much furred, and there is considerable epigastric uneasiness, accumpanied with nausea. An eruption appears on the fifth, sixth, or seventh day, especially on the upper part of the body, which presents very variable characters, either resembling that of scarlatina or measles, or being papular, vesicular, pustular, furunculous, erysipelatous, or petechial. As it disappears, scaly desquamation sometimes takes place. The eruption is attended with itching and tingling.

The symptoms present very different degrees of intensity, and they may assume an asthenic character. Almost all cases recover, the average duration being about eight days, but stiffness and soreness of various parts, with debility, may remain for some time, and sometimes several *relapses* occur.

TREATMENT.—*Emetics* are recommended at the outset, with free purgation. The patient must remain in bed. A *saline diaphoretic* mixture may be given; and *opium* is to be freely administered for the relief of pain. The surface of the skin may be sponged in order to subdue pyrexia; and cold applied to the head for the relief of headache. The *diet* must be regulated, and if there are any signs of depression, stimulants and nourishing food should be given. *Quinine* and *mineral acids* are recommended during the remission, as well as during the period of convalescence.

CHAPTER XXIII.

PESTIS—PLAGUE.

ÆTIOLOGY.—This disease is of a specific nature, and generally prevails as an epidemic, but may be sporadic. Formerly it was met with in Europe, but at the present time its chief seats are Egypt, Syria, Asia Minor, and the coast of Barbary. It is undoubtedly contagious, and can be conveyed in various ways. The chief *predisposing causes* are—overcrowding and bad ventilation; want of cleanliness, with accumulation of filth; insufficient and unwholesome food; debility from any cause; a warm and moist condition of the air; residence on marshy soil, or in the neighbourhood of certain rivers. Epidemics often follow famine, and are generally preceded by a sickly, oppressive, warm, and moist season.

ANATOMICAL CHARACTERS.—The blood is dark, and remains fluid or coagulates imperfectly, while it rapidly putrefies. All the organs are greatly congested and softened, especially the spleen; also the mucous and serous membranes, which may present petechiæ and ecchymoses. The serous cavities contain more or less effusion. The absorbent glands generally are swollen, dark, softened, or disintegrated. Buboes and carbuncles are usually present.

SYMPTOMS.—Plague is characterized by fever, generally of a low type, with the local development of buboes, carbuncles, and petechiæ. The *period of incubation* is very short, and symptoms may set in almost immediately after exposure to infection. After inoculation, the distinctive glandular swellings are developed in four days. The invasion is sudden in most cases, and the severity of the constitutional symptoms varies from a slight fever to one of the most virulent type. The early symptoms are rigors, restlessness, a feeling of debility and languor, headache and giddiness, nausea or vomiting, and precordial oppression or uneasiness. The expression is heavy and stupid, and the eyes look muddy or suffused. Soon the temperature rises, while prostration increases, with a tendency to syncope. The pulse is frequent, but weak or irregular. The tongue is thickly furred, and tends to become dry and brown or black, with sordes on the teeth. The other prominent symptoms are vomiting, sometimes of black matters; great thirst; diarrhœa with offensive stools; hurried respiration; and very foul breath. The urine is much diminished and may contain blood. Hæmorrhages from mucous membranes are not uncommon. Nervous symptoms are generally present, such as delirium, stupor, coma, or convulsions. Death may take place before the appearance of any local signs.

Buboes are formed chiefly in connection with the glands of the groin, but are also seen in the axilla, and about the angles of the jaws. They appear at different periods, being preceded by darting pains. Generally they form abscesses, which discharge and heal slowly, leaving permanent scars. Carbuncles are observed mostly on the limbs, but may affect any part. They vary in number and size, and are liable to end in gangrene, sometimes thus causing great destruction of tissues. Petechiæ, vibices, and livid patches are seen only in bad cases, and there may be extravasations of blood into the subcutaneous tissue.

Prognosis is very grave.

Treatment.—Attention to all *hygienic measures* is essential. The bowels should be freely opened. An *emetic* at the outset is recommended. *Nutritious food*, *stimulants*, *mineral acids* and *tonics* are the remedies which afford the best results. Probably those who advocate the use of *antiseptics* would give them largely in this disease. *Cold affusion* or *sponging* may also be employed. Poultices are indicated for the buboes and carbuncles, followed by antiseptic dressings when they are discharging.

Chapter XXIV.

YELLOW FEVER.

Ætiology.—There is much discussion amongst those who have had opportunities for the observation of cases of yellow fever, as to whether it is *malarial* in its origin, or of the nature of a *specific contagious disease*. Most authorities maintain the latter view, holding that true yellow fever is of the continued type, but that it may be simulated by malarial remittent fevers. There appears to be strong evidence proving that the disease can be conveyed by infection, and it has thus originated in seaport towns in this a[illegible] other countries, owing to the arrival of vessels with cases of yell[illegible] fever on board. Fomites may be the means of propagating it.

Dr. Hamilton, in an excellent Thesis on Yellow fever, sums his conclusions as follows:—

"1. That yellow fever is the highest development of a gro[illegible] of diseases which depend on some unknown cause, but which a[illegible] pears to be in some way connected with, or dependent on, orga[illegible] decomposition.

2. That the various individual diseases of this group may chan[illegible] their type and pass one into the other, according to the intensi

of the cause, or the more or less favourable conditions under which such cause acts.

3. That the general laws of zymotic diseases, as observed in this country, hold good for this group also.

4. That the same causes which augment or develope contagious properties in the zymotic diseases of this climate, will develope contagious properties in yellow fever.

5. And that consequently yellow fever may under such circumstances become contagious and spread."

In certain regions yellow fever is endemic, and it occurs also in severe epidemics. Its principal seats are the West Indian Islands, the seaports of North and South America, the south coast of Spain, Mexico, and the West Coast of Africa. It requires a temperature of at least 72° F., and is rarely met with at an altitude of more than from 2,000 to 3,000 feet above the level of the sea.

Among the chief external *predisposing causes* are mentioned:—long-continued high temperature; a swampy or low-lying and crowded district; filthiness and other anti-hygienic conditions. The disease is more liable to attack children, males, the white races, and those who have recently come into an infected district. Intemperance and other excesses, fatigue, and exposure to night air and dews, also increase the liability to the complaint; while individual predisposition seems to exist in some instances.

ANATOMICAL CHARACTERS.—The body may or may not be emaciated. The skin is of a deep yellow colour, as well as much congested in dependent parts, and in those distant from the centre of circulation. The tissues are generally soft and flabby. More or less congestion of organs is observed, sometimes with extravasations of blood, and effusions into serous cavities. Softening of the heart, with molecular degeneration of its fibres, is usually met with; and the blood coagulates imperfectly, though soft clots are generally found in the cardiac cavities. The stomach is the most frequent seat of morbid changes. It often contains more or less "black vomit," or blood undergoing alteration. Sometimes a black or bloody mucus sticks to the lining membrane. Signs of congestion or inflammation are present in most cases. An inflammatory condition has been described in connection with the membranes of the cord; and the sympathetic system.

SYMPTOMS.—The prominent symptoms of yellow fever vary in different epidemics, and cases exhibit all grades of intensity, from a very mild form of the disease to one of the most malignant type. Usually three stages may be recognized, following a *period of incubation*, the duration of which is usually from two to four days, but it is said that it may range from one to fifteen days.

1. *Invasion stage.* The attack may be preceded by premonitory symptoms, or may come on quite suddenly. Chills generally occur at the outset, but are not always observed in tropical climates. These alternate with a sense of heat, and soon there is marked pyrexia, the degree of this being in proportion to the previous chills, the temperature presenting a morning remission. The pulse is frequent, and in most cases full and strong. The face is

flushed, the eyes are red and suffused, and the expression is anxious and distressed. The skin feels hot, dry, and harsh. The tongue is covered with a white fur, moist, red at the tip and edges, with enlarged papillæ. Sore-throat may be complained of; and there is a constant desire for cool drinks or ice. Gastric symptoms may be present from the first, but as a rule they only become prominent in from twelve to twenty-four hours. They include a sense of oppression, uneasiness, weight, or burning pain in the epigastrium, with considerable tenderness; nausea, violent vomiting, and retching, the vomited matters being of a bilious character, or containing streaks of blood, or chocolate-coloured flocculi. After a while the stomach rejects everything without any effort. There is usually obstinate constipation, with unhealthy stools, which are deficient in bile; and there may be much flatulence. The urine is deficient and of dark colour; it usually contains albumen.

Nervous symptoms are most distressing in the majority of cases. Severe frontal headache is complained of from the first, with shooting pains in the temples and eyes. One of the earliest and most prominent symptoms in most instances, however, is pain in the lumbar regions and limbs, which often becomes so intense as to elicit screams and groans, and to make the patient writhe in agony. As this stage advances, the patient becomes very restless, the mind is confused, or wild violent delirium may set in, attended with hallucinations. Occasionally there is more or less stupor.

The invasion stage lasts from a few hours to two or three days usually, but it may extend to four or five days. It is longer in the milder cases.

2. *Stage of Remission.* A marked improvement is observed at the close of the first stage, which in most cases is only temporary but sometimes is permanent, convalescence setting in, preceded by critical discharges. The symptoms subside more or less completely, the patient feeling comparatively comfortable and often hopeful, occasionally appearing to be quite well. But at this time there are frequently some unfavourable signs, viz., more marked tenderness in the epigastrium; a yellowish tinge of the skin and urine; a slow pulse; and sometimes heaviness or stupor. The duration of this remission is usually but a few hours, but may be prolonged to twenty-four hours.

3. *Stage of Collapse or Secondary fever.* In most cases signs of collapse appear, with great prostration and debility. The skin generally assumes a yellow, orange, or bronzed hue, but not invariably. This spreads from the forehead downwards, and is dependent upon the colouring matter of the blood. The circulat is impeded, the pulse becoming very rapid, weak, and irregul while capillary congestion or stagnation is observed in depend and distant parts, sometimes accompanied with petechiæ and vibic at thesame time the heart may be beating violently. In bad ca hæmorrhages are common, especially from the mucous surfac The tongue tends to become dry, brown, or black; or it is smoo red, and fissured; at the same time sordes may form on the li and teeth. The gastric symptoms return and become very inten

The so-called *black vomit* sets in by degrees, the black colour being probably due to altered blood. It is often preceded by *white vomit.* Black vomit is not a constant symptom, and its exact characters vary, pure blood being sometimes discharged. Similar matters may pass off in the stools. The urine is often more or less deficient, and contains albumen; it is sometimes entirely suppressed or retained. The patient frequently lies in a state of apathy and gloomy indifference. Ultimately collapse becomes extreme, with a cold, clammy, skin; slow, sighing respiration; and hiccup. Consciousness may be retained to the last; or low delirium or coma may set in, with convulsions at the close.

In some cases the symptoms are those of more or less secondary fever, instead of collapse. This course of events may terminate in convalescence; or the fever assumes a typhoid type, ending fatally.

VARIETIES.—As already stated, great differences are observed in the intensity of the symptoms of yellow fever; and also in the nature of the phenomena which are most prominent in different cases. Some patients are prostrated at once, and die very speedily. The named varieties are:—1. *Algid.* 2. *Sthenic.* 3. *Hæmorrhagic.* 4. *Petechial.* 5. *Typhous.* These several terms imply the prominent characters which are peculiar to each variety.

PROGNOSIS.—Yellow fever is always a terrible disease, but the mortality varies much in different epidemics. Death usually takes place from the fourth to the sixth day, but may be delayed to the ninth or eleventh day, or even to a much later period than this. It has been observed that many apparently hopeless cases recover, while others which seem to be mild prove speedily fatal; hence the prognosis is very uncertain. A concise list of favourable and unfavourable signs is given by Dr. Macdonald in Reynolds' *System of Medicine*, Vol. i., p. 492.

TREATMENT.—Attention to all *hygienic measures* and rules of health is of prime importance. At the outset *hot drinks* and *warm foot-baths* have been recommended with *emetics* and *purgatives.* Large doses of *calomel* or of *quinine* used to be given, but they have been proved to be injurious.

It is important to excite the excreting organs to act freely as soon as possible. Copious enemata containing *turpentine* are serviceable. *Saline drinks* may be given abundantly. The skin should be sponged; or wet-packing may be resorted to if the patient is very hot. Liquid food should be given in small quantities, with cool drinks, and plenty of ice. *Alcoholic stimulants*, well-diluted, are also valuable. Champagne is very beneficial.

Various *symptoms* require attention, but especially vomiting. For its relief *lime-water* and *milk, hydrocyanic acid, creosote, chlorodyne,* and *chloroform,* have been found most useful. Great care must be exercised in the administration of *opium* or *morphia,* particularly if there is any tendency to suppression of urine. *Chlorodyne* is suggested as a substitute, in order to procure sleep and relieve pain; hot applications or mustard poultices being also applied externally over painful parts. Hæmorrhages, collapse, and typhoid symptoms must be treated by the ordinary remedies. During convalescence *quinine* may be given.

Chapter XXV.

CEREBRO-SPINAL FEVER. EPIDEMIC CEREBRO-SPINAL MENINGITIS.

Ætiology.—This complaint prevails as an epidemic, and presents the characters of an *acute specific disease*, but its *exciting cause* is by no means definitely made out. There is no reliable evidence that it is at all contagious. It has been attributed to the action of a malarial poison; to excessive fatigue; to the use of unwholesome food, especially diseased grain; or to exposure to cold. Among the chief *predisposing causes* are early age, especially from 15 to 30, the complaint being uncommon after 35, and very rare after 40, but not infrequent in children; the male sex markedly; and a cold season, most cases occurring during winter or early spring. Unfavourable hygienic conditions do not seem to have much influence. Cerebro-spinal fever is met with as an epidemic principally where young people are collected together, and it is particularly common among young recruits in barracks.

Anatomical Characters.—The most important morbid changes observed in cases of cerebro-spinal fever are those indicative of inflammation of the membranes of the brain and spinal cord. There is hyperæmia of the scalp and of the structures within the cranium, the sinuses of the dura mata containing much dark fluid or softly-coagulated blood. There may be small hæmorrhagic effusions in connection with the dura mater. The sub-arachnoid space contains excess of serum, but the most striking appearance is due to the presence of more or less exudation here, both over the convexity and at the base of the brain, though it is much more abundant in the latter situation, the cranial nerves being often imbedded in it. The amount and characters of this material vary with the duration of the disease; in cases of very short duration it is generally in small quantity, whitish, and soft; later on it becomes more abundant, yellowish or greenish, and somewhat purulent-looking; while in prolonged cases it is again whiter and firmer, there being also more serum under these circumstances. The brain-substance is unduly vascular and may be softened, especially in the neighbourhood of the ventricles, which contain in many cases a small quantity of purulent-looking fluid, or occasionally much serum.

The membranes of the cord present similar changes, there being a purulent fluid under the arachnoid, with exudation, which is almost entirely confined to the posterior surface.

Rigor mortis is well-marked. *Post-mortem* congestion rapidly sets in, and purpuric patches are usually visible. The blood is dark and tarry-looking, and the muscles are of a deep colour. The spleen, liver, and lungs are often much congested, and there may be signs of inflammatory complications. Purulent infiltration of the eyeball has been occasionally met with; and also effusion into the joints.

Symptoms.—In the great majority of cases cerebro-spinal fever is ot ushered in by any premonitory symptoms, and the *invasion* is quite udden, with a rigor or chill; faintness; intense headache, causing he patient to cry out, and being usually more or less general, but ometimes localized, especially at the back of the head; vertigo; requently epigastric pain and cerebral vomiting, the vomited atters being generally of a bilious character; great restlessess; and pyrexia. The pupils are contracted. In a day or two e pain extends to the back of the neck, and then down the spine, eing increased in this locality by movement and pressure. The ead is drawn back, partly voluntarily in order to relieve pain, artly from spasm of the muscles. In three or four days distinct tanic spasms set in, there being often well-marked opisthotonos, nd occasionally trismus, risus sardonicus, or strabismus. The spiratory muscles may become involved, causing serious interrence with breathing. The skin generally becomes extremely nsitive, and severe pains are felt in the limbs, these being aggraated or sometimes only produced by movements of the spine. At rst the mind is clear, but soon mental confusion is observed, folwed by muttering delirium, and afterwards by stupor, which in fatal ses ends in deep coma. In rare instances epileptiform convulons occur; or there may be hemiplegia, paraplegia, or signs of aralysis of some of the cranial nerves. Amaurosis is occasionally oticed; and deafness is not uncommon.

Early in the course of the disease herpes usually appears, chiefly bout the lips and face, but it may be on the limbs or trunk. ther forms of eruption are sometimes seen, and the body beomes more or less thickly scattered over with purpuric spots in ad cases, in some instances considerable patches being inolved, which may become quite black or even gangrenous; such cases mucous hæmorrhages are also liable to occur. he degree of pyrexia varies much in different cases, but the temerature usually ranges from 100° to 103°, in some instances rising 105° or higher. It has no regular course, and often presents sudn variations, but there is generally a slight evening exacerbation. he pulse rises to 100 or 120, but is liable to considerable changes frequency; it is sharp, weak, and wanting in tone. The spirations are hurried. The bowels are constipated, and the domen is retracted. The urine may contain a large quantity albumen in severe cases; and when stupor sets in, it is retained passed involuntarily.

A favourable termination of the complaint is indicated by a adual subsidence of the nervous phenomena; restoration of the ental faculties; and a steady fall in temperature. Convalescence very slow, and headache usually continues for some time. There ay only be partial restoration, the mind being permanently imired, or some form of paralysis remaining; or death may take ace after many weeks, from general marasmus.

Cases of cerebro-spinal fever present much variety in their serity, and in their combinations of symptoms, and different writers ve arranged them into corresponding groups or *varieties*.

COMPLICATIONS AND SEQUELÆ. These are not uncommon, the chief being:—inflammatory affections of the eye-ball, especially the right, which may end in suppuration and total destruction of its tissues; inflammation of joints ending in purulent accumulation; bronchitis, pleurisy, or pneumonia; pericarditis; and parotitis.

PROGNOSIS. Cerebro-spinal fever is a grave malady, but the mortality varies in different epidemics from 20 or 30 to 80 per cent., the average being about 60 per cent. The early appearance of purpuric spots, and the occurrence of hæmorrhages, are very unfavourable signs. Death is most to be feared during the first few days, but it may take place after many weeks. The mortality is highest at the commencement of an epidemic; and amongst young children, or persons over 30 years of age.

TREATMENT.—If there is much depression at the outset, it is desirable to give small quantities of *stimulants*, and to apply heat externally. Subsequently the indications are to promote absorption of the exudation; to relieve the pain and muscular spasms; to support the strength of the patient; and to treat symptoms and complications as they arise. *Mercury* and *iodide of potassium* have been given with the view of aiding absorption, but the former drug seems to be quite inadmissible in the treatment of cases of cerebro-spinal fever. The application of a few leeches to the temples or behind the ears often relieves the headache. *Ice* should be applied constantly to the head and along the spine. In prolonged cases it has been recommended to blister the nape of the neck and spinal region. The most reliable remedies for relieving the symptoms are *opium* internally, or hypodermic injection of *morphia; hydrate of chloral; bromide of potassium* in full doses; and *belladonna*. The patient must have nutritious and sustaining food throughout; and considerable quantities of *alcoholic stimulants* are frequently required. Enemata are often of much service for their administration, as well as for acting on the bowels. It is requisite to pay due attention to *hygienic conditions*. During convalescence *tonics* and *good diet* are necessary.

CHAPTER XXVI.

MALARIAL OR PALUDAL FEVERS.

1. ON MALARIA OR MARSH-MIASM.

THERE are certain affections which have been almost universally recognized as being the result of the action of a *malarial* or *telluric* poison upon the system. Amongst these the most striking are fevers of an *intermittent* or *remittent* type, before considering which it is therefore requisite to indicate the main facts relating to malaria. Of the existence of such a poison there can be no doubt, though this has been denied by a few observers, some of whom have attributed the effects noticed to a chill; others to some electrical condition of the atmosphere.

1. *Origin and propagation.*—The malarial poison is ordinarily an emanation from soils more or less rich in organic matter, and which are not devoted to the maintenance of healthy vegetation. The essential conditions for its production are—decomposition of vegetable organic matter; a certain temperature; and a certain degree of moisture. Without the first of these it cannot possibly originate. Very rarely are malarial diseases generated under a temperature of 60° F., and the heat must be of some duration. As this rises, they become more prevalent and more severe, and hence they are very virulent in certain tropical climates. There must not be too much moisture, else the poison is absorbed by it; while it is not formed if the atmosphere is dry.

The necessary conditions, as regards vegetable decomposition and moisture, are met with under the following circumstances:—1. In marshes and swamps, unless the soil is peaty or constantly overflowed with water, conditions which materially interfere with the development of malaria. 2. Where there is much vegetable matter in the soils of valleys and ravines, at the bases of mountain ranges in tropical climates, in alluvial deposits, along the banks of tropical rivers, in old estuaries, the deltas of rivers, &c. 3. Where surfaces covered with much vegetation have been temporarily overflowed, so as to be left moist. 4. During the draining of lakes, ponds, &c. 5. In sandy plains containing organic matter, if there is a subsoil of clay or marl, conditions often existing simultaneously in old river courses. Also in the lower chalk formations, with a subsoil of clay or marl. 6. In certain hard granitic or trap rocks containing organic matter, such as fungi, especially if they are disintegrating. 7. In turning up the soil in the early cultivation of land, digging canals, making railways, &c. 8. Where copious vegetation has been cleared away in dense jungles for purposes of cultivation, sufficient being left behind to decompose. It frequently happens that the first result of attempts at cultivation of a new district is the production of malarial diseases, which ultimately disappear. 9. When tracts of land are from any cause allowed to fall out of cultivation, especially if the soil is rich in organic matters. 10. On board ship, where decomposing vegetable matter is mixed with bilge water; or where malarial mud has in any way been accumulated.

The following conditions influence the development and propagation of malarial affections:—1. *Season.* Usually these complaints are most prevalent towards the latter part of summer and in the autumn, and many malarial districts may be visited without any danger in the winter, which cannot be approached in the warm season. They are particularly liable to occur after long-continued dry and hot weather, followed by warm rains. In climates where the summer is short, even though very hot, they are not prevalent. 2. *Water.* Abundance of water is a protection against malarial affections, because it absorbs the poison. Hence they are temporarily diminished by long and heavy rains and floods. Any deep sheet of water, especially running water, affords some degree of protection, and thus the intervention of a river may prevent the poison from passing from one of its banks to the opposite one. A ship at a little distance from shore is in comparative safety. Some believe that sea-water is peculiarly protective, though it is said that the occasional admixture of salt water increases the emanations from marshes. 3. *Winds.* These frequently convey the malaria for a considerable distance along plains, and may thus be the means of originating malarial affections in places remote from a malarial district, also counteracting the good effects of the intervention of water, &c. On the other hand, a storm may drive away the poison altogether. 4. *Low districts* are more dangerous than those which are elevated, the malaria tending to cling to the earth. By the aid of ravines and hot air, however, it may be carried up mountains to a great height, it is stated even as much as 2000 or 3000 feet. The lower rooms of houses are more dangerous than the upper. 5. *Trees.* When in large numbers these afford decided protection, both by interfering with the propagation of the poison, and by keeping off the sun's rays from the soil; in some cases, however, they seem to be injurious. Certain trees are said to exert a specially protective influence, particularly the *Eucalyptus globulus*, but this is more than doubtful. 6. *Mountains* and *hills* interfere considerably with the dissemination of malaria. 7. *Time of the day.* Morning and evening dews augment the danger from malaria materially, probably from condensing the poison. It is highly dangerous to sleep in tents at night in malarial districts. 8. The *air of cities* in some way renders the poison innocuous, for though a malarial disease may be raging in the surrounding districts, it does not penetrate far into their interior. 9. *Artificial heat* destroys malaria, if sufficiently intense. 10. *Individual susceptibility* is increased by certain circumstances, viz., recent arrival in a malarial district; fatigue and exhaustion from any cause; exposure to the full heat of the sun; sudden changes in temperature, and chills of all kinds; intemperance; exposure on an empty stomach; over-feeding; mental exhaustion or nervous depression; and over-crowding. Some persons are far more susceptible than others. Young children and old persons are least subject to malarial affections; and males are said to be more predisposed than females. White races suffer more than blacks. It is stated that the use of drinking water from a malarial district may produce malarial diseases.

2. *Nature.*—Much doubt exists as to the nature of the malarial poison. It has been supposed to be a gas resulting from vegetable decomposition; but the favourite view is that it is *organic*, consisting either of *microscopic plants* or their *spores*, or of *animalcules*. At present, however, neither chemical nor microscopic investigation has succeeded in demonstrating the nature of malaria. It has been suggested that there are different kinds of paludal poisons, but of this there is no proof. When animal matters are mixed with the decomposing vegetable material, the poison which escapes seems to be more virulent.

3. *Mode of entrance into the system, and the effects produced.*—The poison is chiefly inhaled, and then absorbed by the pulmonary membrane; it may also be taken up by the stomach, which it often

seriously disorders; and possibly by the skin. Malaria acts on the nervous system, and gives rise to fevers of an intermittent or remittent type, followed after a time by permanent organic changes, especially in the liver and spleen; while it also originates various neuralgic affections. Certain other disorders are attributed to its influence, such as diarrhœa, gastric derangements, palpitation of the heart, pains in the limbs and joints, amenorrhœa; as well as a general state of ill-health, and a peculiar malarial cachexia, with ultimate degeneration of the race. A large number of males in certain malarial districts are said to be impotent. Dysentery and hepatic abscess are very prevalent in certain tropical malarial regions. Malaria imparts a peculiar periodicity to the affections which it originates, and once they have existed they are liable to recur on subsequent occasions independently of the action of the original exciting cause, sometimes, indeed, apparently arising spontaneously. Various complaints tend to assume a periodic character in malarial districts.

4. *Prophylaxis.*—The precautions to be taken by those who are obliged to reside in malarial districts may be gathered from what has been already stated. Everything must be avoided which increases the individual tendency to malarial diseases; and every means of protection employed, so far as is possible, in arranging a place of residence and other matters. It is an useful practice to give *cinchona bark* or *quinine* daily. *Garlic* and the *eucalyptus globulus* have also been used as preventives.

II. Intermittent Fever—Ague.

Ætiology.—Ague is the malarial fever which prevails in this country, mainly in low marshy districts. Cases are also met with here in which the complaint has originated in foreign climates. Once the disease has been excited, subsequent attacks may arise without any exposure to malarial influence.

Anatomical Characters.—The spleen presents the most notable changes, being at an early period much enlarged from congestion, softened, and sometimes pulpy. After a while it becomes permanently hypertrophied and firm, constituting the so-called *ague-cake.* The liver is also congested and soft, and ultimately hypertrophied; t has been stated that albuminoid disease of this organ is occasionally produced. The stomach and duodenum are often congested, heir mucous membrane being softened; in some cases ulcers have been observed. In rapidly-fatal cases the heart is softened, and its tissue undergoes degeneration. Chronic Bright's disease s believed to be set up sometimes by ague. In persons who have resided for a long period in malarial districts, black pigment is often found in the spleen, liver, and kidneys. The blood is unhealthy, and may also contain black pigment.

Symptoms.—Ague is characterized clinically by paroxysms of fever, running through certain definite stages, and occurring at more or less regular intervals, with intermediate periods of complete apyrexia.

The *invasion* is generally indicated by the ordinary symptoms premonitory of fever, which are noticed for some days before the disease declares itself, the pyrexia presenting well-marked remissions, with a periodic tendency. Sometimes the attack is sudden.

A *paroxysm* or *fit* of ague consists of three successive stages, named respectively the *cold;* the *hot;* and the *sweating* stage.

1. *Cold stage.* Ordinarily a fit of ague is preceded by general uneasiness and languor, inaptitude for any exertion, headache, and loss of appetite. Soon the patient feels cold, first in the limbs, then along the back and over the body. The teeth begin to chatter, and finally the entire frame shivers. At the same time the general surface of the skin appears pale and shrunken, especially that of the face, the features being pinched and sharp. The tips of the fingers and lips are blue, and in severe cases the whole surface assumes a purplish hue. Cutis anserina is frequently observed. The patient often complains of pains in the back and limbs, as well as of headache. The tongue is usually pale, moist, clean, and cool; appetite is lost, but thirst is a frequent symptom. Nausea and vomiting are not uncommon, with uneasiness and a sense of weight in the epigastrium. There is a feeling of dyspnœa, with hurried breathing, and often a dry cough, the expired air being cool. The pulse is usually frequent and small, and may be irregular.

The intensity of this stage varies greatly. There may be signs of serious depression or collapse, with a tendency to stupor or coma. Its duration ranges from a few minutes to three, four, or five hours.

2. *Hot stage.* The transition to this stage may be sudden, but is generally gradual, being indicated by alternate flushings and chilliness, or by parts of the body becoming warm. When it becomes fully developed, the skin feels burningly hot and dry, is red and tumid, and sometimes a patchy rash appears. The face is flushed, and the eyes are injected and sparkling. There is intense thirst, with dryness and heat of mouth, total anorexia, a white tongue, and sometimes nausea or vomiting. The heart and great arteries throb, and the pulse is generally strong and full. Respiration is more quiet than in the first stage. Headache is always present, with a sense of throbbing, and sometimes more or less delirium occurs, which may be very violent, or convulsions set in.

This stage lasts usually from three to eight hours, the extremes being from two to eighteen hours.

3. *Sweating stage.* Perspiration breaks out first about the forehead, and then by degrees extends over the body. Its amount varies, but it is generally considerable, so that the bed-clothes become saturated, and sometimes even the bedding. In cases originating in certain malarial districts, the perspiration is said to have a peculiar sickly and most disagreeable odour. It continues to flow for some time, during which the pyrexia becomes reduced, and the symptoms rapidly abate; the patient usually soon falls asleep, and awakes feeling well or comparatively well. Along with the sweating there is a critical urinary discharge, and not unfrequently diarrhœa. Anasarca has been observed when sweating is deficient.

Intermission. At first a person suffering from ague may feel quite convalescent during the periods intervening between the paroxysms, but soon more or less languor and depression is experienced, with neuralgic pains, and loss of appetite, while the patient becomes pale and anæmic. After a while permanent organic mischief is established, especially in connection with the spleen, attended with serious symptoms, which are described in the chapter on DISEASES OF THE SPLEEN.

Temperature. The course of temperature in ague is quite characteristic, the paroxysm being marked by a rapid ascent; short and intense stationary period; and critical defervescence: the temperature in the intervals being perfectly normal. A rise is observed as soon as, or even before, the cold stage begins; at first it is only slight and gradual, but soon becomes rapid, continuing during the hot stage, and sometimes into the commencement of the sweating stage. The temperature generally runs up to 105° or 107°, but may reach 108°, 110°, or even 112° in hot climates. When sweating begins, there is generally a slight alternate rise and fall at first, but soon a steady fall sets in, of 2° or more every five to fifteen minutes, until the temperature becomes normal. It is important to notice, that even before the paroxysms are experienced, and after they have apparently ceased, the temperature has been observed to rise at the usual periods.

Urine. During the cold and hot stages water is increased, but it diminishes at the close of the latter, and is very deficient while sweating is going on, so that the urine becomes concentrated, and its specific gravity rises. Urea suddenly increases in amount as soon as the rise in temperature begins, and this continues until the sweating stage sets in, when it rapidly or gradually diminishes, often falling below the normal. A relation is said to exist between the amount of urea discharged and the temperature. Uric acid is also considerably in excess, and urates are generally deposited at the close of the fit. Chloride of sodium is greatly increased; while phosphates are much diminished or even disappear after the height of the paroxysm. Albumen, blood, or casts are not unfrequently present in the urine. In the intervals the state of the urine varies much. It is not uncommonly alkaline in reaction. Urea is deficient as a rule during the intermissions.

TYPES AND VARIETIES.—The chief types of intermittent fever are hose founded upon the length of the interval between the paroxysms, viz.:—1. *Quotidian*, in which there is a daily paroxysm, with an interval of twenty-four hours. 2. *Tertian*, where a fit occurs every other day, the interval being forty-eight hours. 3. *Quartan*, a paroxysm taking place every third day, the interval being seventy-two hours. These are the usual types, but excepionally the following are met with:—4. *Double quotidian.* 5. *Double tertian*, a seizure occurring every day, but at different hours, or presenting different characters. 6. *Double quartan*, out of three days two having each a paroxysm, the third none. 7. *Duplicated ertian*, there being two paroxysms one day, none the next. 8. *Erratic* or *irregular*. Other very rare types are described.

The *quotidian*, which is the most common, has the longest paroxysm; this is said to occur earlier in the day, and to have the shortest cold stage, but the longest hot stage. In the *quartan* variety, which is the least common, the conditions are just the opposite; the *tertian* being intermediate. Sometimes the fits tend to begin earlier or later each time, and thus ultimately one type may be converted into another; or the change may take place suddenly.

A paroxysm may present certain peculiarities. Occasionally one or more of the stages may be wanting. The phenomena are in rare instances limited to certain parts of the body; thus in paralyzed patients they may be confined to the non-paralyzed parts.

Certain forms of ague are also described depending upon the character of the symptoms present, viz:—1. *Sthenic*. 2. *Asthenic*. 3. *Pernicious* or *malignant*, the last approaching the *remittent* type, and only occurring in hot climates, being attended with delirium, coma, or an algide condition.

COMPLICATIONS AND SEQUELÆ.—Persons suffering under the influence of malaria are very liable to *pneumonia*, which comes on rapidly, often involves both lungs, and is of a very dangerous character. This is particularly observed in patients returning from hot malarial climates to cold climates. The *blood* is also prone to undergo acute changes of a serious character, ending in marked anæmia, with excessive formation of white corpuscles, this condition being accompanied with dropsy. Various forms of *neuralgia* are apt to follow ague.

PROGNOSIS.—Intermittent fever is not often directly fatal in this country, and can usually be cured. Some of its varieties are exceedingly grave, especially those classed as *pernicious*. The *complications* just mentioned are also very serious. If treatment has been long delayed, so that the malarial cachexia has become established, it is difficult to bring about a complete cure. The *quartan* type of ague is the most obstinate form to be got rid of. It must be remembered that those who have suffered from this disease are liable to future attacks, apart from any exposure to malarial influence.

TREATMENT.—1. *During the paroxysm*. In the *cold stage* the patient should remain in bed, being well-covered with blankets, some form of dry heat being applied externally, and hot drinks administered. In this country nothing further is necessary as a rule. When there is much depression, *diffusible stimulants* are required, and a little *opium* may be given to relieve great restlessness. Persistent vomiting is best checked by giving an emetic of *sulphate of zinc*, with plenty of warm water. If this stage is greatly prolonged a hot-air bath may be employed. In the *hot stage* the skin should be sponged freely; and cooling *effervescent* or *saline* drinks be given. During the *sweating stage* nothing is necessary but to keep the patient covered so as to prevent a chill.

2. *During the intervals*. The great remedy at this time is *quinine*, and it rarely fails to bring about a speedy cure. There is much difference of opinion as to the mode in which it should be administered. By some it is recommended to give one large dose- gr. xx—xxx—either before, or at the close of, the paroxysm. In a lar

number of cases which came under my treatment at the Liverpool Northern Hospital, I found most satisfactory results from the administration of gr. iii—iv every four or six hours during the intermission, and therefore am disposed to adhere to this practice. In some cases it is said that the stomach rejects quinine, and then it may be combined with a little *opium*, or administered by *enema*. The *subcutaneous injection* of the *neutral sulphate of quinine* has also been advocated. It is important to notice that the remedy must be continued for some time after the paroxysms have apparently ceased, that is, until the temperature has become quite normal. Various substances have been employed as substitutes for quinine. Of these the only reliable remedies are *cinchona bark*, *cinchonine*, *quinidine*, *cinchonidine*, *salicine*, and *arsenic*. The last is decidedly beneficial, and has the advantage of being cheap. It is best given in the form of *Fowler's solution*, beginning with four or five minims three times a day. The *alkaline sulphites* have also been recommended.

3. *Symptoms* and *complications* may arise, requiring special attention. They must on no account be permitted to interfere with the use of *quinine*. Possibly venesection may be indicated, but I have never met with a case of ague necessitating it in this country. Adynamic symptoms must be treated by external and internal stimulation.

For the *cachexia* induced by ague, as well as for the different *neuralgic* affections, *quinine*, *iron*, and *arsenic* constitute the most reliable remedies, and they may be advantageously combined. *Phosphorus* may also be found serviceable. The *tincture of eucalyptus globulus* has been highly extolled. Patients should immediately be sent from a malarial region to some suitable climate, care being taken to attend to all hygienic conditions; to give good food; and to see that the clothing is warm, especially if they have to undergo a change from a hot to a cold climate. Various mineral waters and baths may be useful, such as Carlsbad and Friedrichschall waters, and warm baths or Turkish baths.

4. The *preventive* treatment of ague is that indicated for malaria in general, and, if possible, residence in a malarial district should be immediately discontinued.

III. Remittent Fever.

Ætiology.—The malarial fevers of hot climates often assume a *remittent* type, there being irregular exacerbations and remissions, the latter being less distinct if the fever is very intense. They vary much in their severity, and have received many local names.

There is no distinct limit between this class of fevers and those of an intermittent type, both being due to the same cause, but this is aided by a high temperature in originating remittent fever. One type sometimes changes into the other.

Symptoms.—There are generally *premonitory* signs, but the attack may be sudden. Gastric irritation is usually first noticed, there being a source of uneasiness or oppression at the epigastrium, nausea, and anorexia; with headache, general pains, and a feeling of languor. Some chilliness or rigors may be experienced, but there is no *cold stage* of any duration, and the temperature rises immediately. The *hot stage* becomes very intense, the skin being burning and dry, the face flushed, the eyes injected, with intense headache, giddiness, restlessness, sleeplessness, and often delirium, which is sometimes violent. Vomiting and nausea are commonly present, the vomited matters consisting first of food, then of watery fluid, and finally of biliary matters; they may become brown or black. A sense of great oppression and weight is felt in the epigastrium; the tongue is furred and tends to dryness, the lips are parched, and there is intense thirst. The pulse is frequent, either full, or small and compressible.

The symptoms abate generally in from six to twelve hours, but may continue for twenty-four, thirty-six, or forty-eight hours, or even longer. Some perspiration usually breaks out as improvement takes place.

The *remission* is of variable duration, and this is followed by an exacerbation, of greater intensity than the first attack. The time at which remissions take place, as well as their number, differ in different cases. When the disease is established, there is almost invariably a morning remission. The exacerbation may begin at noon, declining towards midnight; or it may begin at midnight and last till morning. In severe cases there may be a double exacerbation, viz., at noon and midnight.

As the case progresses, signs of intense adynamia may set in. Yellowness of the skin is common; and hæmorrhages sometimes occur. These symptoms, associated with black vomit, often cause remittent fever to resemble specific yellow fever. Occasionally marked jaundice is observed. The spleen and liver are usually enlarged and tender. The urine is generally stated to be scanty, dark, and of high specific gravity. In India Dr. Maclean has noticed just the opposite characters. It is always acid, and rarely albuminous. Urea is increased, and uric acid diminished, until convalescence is established.

The entire *duration* of the disease ranges from five to fourteen days usually. The *terminations* are in death, from blood-poisoning or exhaustion; in recovery, usually ushered in by free perspiration, but sometimes taking place gradually; or by transition into an intermittent fever.

TREATMENT.—It is important to attend to *hygienic conditions* and especially to have good *ventilation*. During the hot paroxysm cool drinks should be given freely, and, if necessary, cold may be applied to the head. *External application of cold*, by one of the methods recommended for hyperpyrexia, is most valuable. Vomiting must be checked by the usual remedies. As soon as the remission occurs, *quinine* must be given in 10, 15, or 20 grain doses every two hours; if the stomach rejects this remedy, it must be administered by enemata. *Quinine* is to be given until the system has become saturated with it, and signs of *cinchonism* are evident. This drug is also to be used should any complications arise. A compound named

Warburg's tincture has gained much repute in the treatment of remittent fevers.

All antiphlogistic remedies are to be deprecated, as well as the use of *calomel*, except as an aperient. It is desirable to keep the bowels well opened. Bland nourishing *diet* is necessary; and *stimulants* are often required in considerable quantities.

CHAPTER XXVII.

ON THE DIAGNOSIS OF ACUTE SPECIFIC DISEASES.

FOR several reasons it has seemed to me advantageous to discuss the diagnosis of *acute specific diseases* in a connected manner, and to devote a special chapter to the consideration of the subject. Obviously it is of great moment in ordinary practice that an accurate diagnosis of either of these affections should be arrived at as speedily and promptly as possible, and, in the large majority of cases, anyone possessing the requisite knowledge of their characters may come to a positive conclusion on this matter without hesitation or delay. At the same time it is always important to avoid carelessness or undue haste in forming an opinion. Not a few cases come under observation, more especially those of a febrile character, in which it is impossible at the outset to arrive at any certain conclusion as to their nature, and under such circumstances it is better to postpone the diagnosis for a shorter or longer period, watching the progress of events, and observing the phenomena which present themselves. In some doubtful cases it may be allowable, or even desirable, to give an opinion as to the probable nature of the disease, but it is a great mistake to venture upon any definite and dogmatic diagnosis on insufficient data.

Several of the *acute specific disorders* present such characteristic symptoms, that once these are fully pronounced, there is no difficulty in recognizing them. Others, however, are not so clearly marked off, and careful consideration may be necessary in order to discriminate between them. I proceed therefore to point out briefly the chief facts which have to be known and taken into account, in order to form an opinion as to the diagnosis of these complaints.

1. The diagnosis is materially assisted by a correct acquaintance with the *ætiology* of each acute specific disease, and by the information elicited in connection therewith in any individual case. It is important to remember which of these complaints are infectious, and which are frequently, or may be exceptionally, originated in other ways; the modes in which the contagium is conveyed in each disease, and the channels by which it enters the system; the conditions, both intrinsic to the individual and extrinsic, which affect its propagation; the period of incubation; and the effect upon the patient of previous attacks, whether these afford probable security against future attacks, or increase the predisposition to the disease.

The early recognition of a particular acute specific disease may be much aided by the fact that an epidemic is prevalent at the time; or by direct evidence that the patient has been exposed to infection in some way, or has been under the influence of some other well-known cause, such as malaria. It not uncommonly happens, however, that very careful enquiry is necessary in order to trace infection, as, for instance, in many cases of typhoid fever and scarlatina; the contagium too may be so obscurely conveyed by fomites, that it may be most difficult or even impossible to track it to its original source; while it must be borne in mind that some diseases which are ordinarily transmitted by infection, such as typhus or relapsing fever, may probably be generated *de novo* under certain circumstances. Hence, even if a source of contagion cannot be discovered, it does not necessarily exclude a specific disease which may be suspected to be present. As an illustration of the value of remembering the conditions which influence the occurrence of acute specific diseases, may be mentioned the effect of age and hygienic conditions with regard to typhoid and typhus fever respectively. Most of these complaints are as a rule only observed once in the same individual, and hence in the case of any suspected fever, it is well at the outset to find out what affections of this class the patient has previously suffered from, so that these may be excluded by probability. At the same time the fact must be recognized that second and even third attacks of the eruptive fevers do sometimes occur; while certain of the acute specifics, such as erysipelas, are predisposed to by previous attacks, and this may help in fixing upon, or at least in suspecting one of these affections, before the clinical phenomena are at all significant.

2. Obviously it is essential to have a complete and correct acquaintance with the *clinical history* of each of the affections now under consideration, before a diagnosis can be made with any degree of certainty. This includes:—

a. Its *mode of invasion.*

b. Its more *characteristic symptoms,* particular attention being paid to those which are presented at an early period.

c. The chief facts connected with the *skin-eruption,* in the case of those diseases which are attended with such a phenomenon.

d. The *degree of pyrexia,* and *course of temperature,* as indicated by the thermometer, when this is at all significant.

e. Its ordinary *course, duration, modes of termination,* and *mortality.*

f. The *varieties* it may assume, so as to be prepared for any deviation from the usual type.

g. Its ordinary *complications* and *sequelæ.* A knowledge of these is useful in several ways in a diagnostic point of view. Thus it may guard the practitioner against mistaking some local mischief which he may have discovered, *e.g.*, pneumonia, for the entire disease, when it is but a complication of some fever; it enables him further to be on the look-out for such morbid conditions as are liable to arise in the course of, or after any particular fever; while the development of some special and peculiar complication or sequela, may throw much light upon the nature of an otherwise obscure case.

3. The diagnosis of the specific fevers more especially, is greatly aided and facilitated by a definite knowledge of the complaints which they severally resemble, and with which they are likely to be confounded. In the first place it is requisite to bear in mind with regard to each of them, the diseases of its own class which approach it in its characters, and are liable to be mistaken for it; and, secondly, other febrile diseases which are more or less like it, whether dependent upon local mischief, or due to some deleterious agent in the system, such as rheumatic fever or pyæmia.

It would only involve unnecessary repetition to recapitulate the points just indicated with reference to each acute specific disease, as they have been already considered in detail, and my main object in this chapter has been to sketch the kind of information required, and to suggest the line of reasoning to be adopted, in order to arrive at a diagnosis of individual cases of these complaints. I propose, however, first to make a few remarks respecting febricula; then to present in the form of a table the chief clinical features of the principal fevers prevalent in this country, and the diseases for which they are liable to be mistaken; and, lastly, to notice briefly each of the more peculiar, or less common specific affections.

FEBRICULA. The occurrence of a sharp febrile attack, unattended with phenomena characteristic of any other fever, and not dependent upon any discoverable local lesion, may be looked upon as indicative of *febricula* or *synocha*. The rapid rise of temperature is important, especially in distinguishing this complaint from typhoid fever. At the outset of course it is often impossible to say what may be the nature of any particular case; and there can be no doubt but that many cases of so-called febricula are really examples of pyrexia associated with some local morbid condition which has not been detected. The opinion has been advanced that within the group of cases classed as febricula are included more than one form of specific fever, perhaps several, but the present state of knowledge certainly does not warrant any such assumption.

DIAGNOSTIC TABLE OF THE PRINCIPAL FEVERS.

In the following table, the main clinical characters of the diseases recognized as *specific fevers*, which are ordinarily met with in this country, are arranged according to the plan indicated in the preceding page; after which the affections which they severally resemble, and are likely to be mistaken for, are pointed out; and lastly any special facts which demand attention, as bearing upon the diagnosis of either of these complaints, are noticed.

	TYPHOID FEVER.	TYPHUS FEVER.	RELAPSING FEVER.	SCARLA
MODE OF INVASION.	Often very gradual and ill-defined. Patient cannot fix date. No marked rigors. May be only diarrhœa for some time.	Generally well-marked, and may be very sudden. Usually marked rigors. Speedy prostration, and high fever.	Generally remarkably sudden. Severe rigor. Great weakness.	Usually dist liness, but rigors. Ra May be ne nomena, su vulsions or
CHARACTERISTIC SYMPTOMS.	Marked frontal headache, but other head symptoms not prominent, or only come on at a late period. Abdominal symptoms, viz., pain and tenderness. especially in right iliac fossa; tympanitis; gurgling in right iliac region; diarrhœa, with peculiar stools; not uncommonly intestinal hæmorrhage. Enlarged spleen. No particular prostration. Epistaxis not uncommon. Tongue peculiar at first. Pulse liable to great variations.	Great depression and prostration. Dingy and muddy aspect of countenance, with dusky flush on cheeks, and dull heavy expression. Early and marked head symptoms and low nervous phenomena. Rapid tendency to typhoid condition. Pupils often much contracted.	Sharp frontal headache. Severe pains in back and limbs. Pains in epigastrium and hypochondriac regions. Bilious vomiting with retching. Jaundice frequently. Enlargement of liver and spleen. Peculiar aspect of countenance. No marked nervous symptoms usually. Much debility, but not prostration. Pulse very frequent at an early period. Epistaxis and other hæmorrhages common.	High pyrexi face. Sor variable but alway Vomiting. berry" ton prominent symptoms Pulse ver generally full.
SKIN-ERUPTION.	7th to 12th day. Generally confined to abdomen, chest, and back. Comes out in successive crops, each lasting 2 to 5 days. Consists of minute rose-coloured spots, slightly raised, disappearing on pressure. Only a few visible at the same time. Continue to appear until 28th or 30th day, or even later. Sudamina not uncommon.	4th or 5th day usually. First about back of wrists, axillæ, or epigastrium; spreads rapidly over body and limbs, but rarely seen on neck or face. Entire eruption out in from 1 to 3 days. Consists of:— *a.* Irregular, dusky-red subcuticular mottling; *b.* maculæ or mulberry spots, deepening in colour, and soon not fading on pressure. Disappears from 14th to 21st day. Skin gives off peculiar odour. Sudamina less common than in typhoid.	No specific eruption. Sudamina may appear at crisis. Often fine desquamation of cuticle after crisis.	2nd day usua on neck part of spreads n face and and limb sists of a ginning points, coa form patcl cover enti colour mo bright-red; vation Reaches h to 5th d gradually 9th or 10th lowed by desquamati puffiness of much itcl tingling, w ing sensati mina comn
DEGREE OF PYREXIA, AND COURSE OF TEMPERATURE.	Peculiar ascent; rise of 2° each evening with morning remission of 1°, therefore daily rise of 1°; temp. finally reaches to from 104° to 106° in evening usually, with slight morning remission. Decline gradual, indicated by more distinct morning remission, followed by slight evening fall, with very considerable morning remission; some time before evening temp. normal.	Regular ascent without any remission until 4th or 5th evening, up to 104°, 105° or higher; then usually slight morning remission and marked fall on 7th morning; subsequent rise, but not to former maximum usually; then continuous, with morning remission varying from $\frac{6}{10}$° to $1\frac{1}{2}$°. Rapid decline, temperature becoming normal in from 12 to 48 hours.	Continuous ascent for 4 or 5 days; temp. at last reaches 104° to 108°; slight morning remissions. Rapid fall at crisis to below normal, with subsequent speedy rise to former temp. or even higher; sudden defervescence again at second crisis.	**Continuous til rash height; reaches 10 may be higher; sli ing remis fervescenc by crisis; when er gins to fad**

MEASLES.	SMALL-POX.	VARICELLA.	ERYSIPELAS.
sudden, and gener- arked. Chilliness or Occasionally con- ns.	Generally sudden. Often repeated and strong rigors. Rapid pyrexia.	Not marked.	Often gradual, with indefinite febrile symptoms.
e pyrexia. Catar- phenomena, viz., , &c. Only slight hroat, if any. More catarrh of respira- ssages, extending to i, and increasing eruptive stage. be much diarrhæa miting.	High pyrexia. Uneasiness or pain in epigastrium. Nausea and much vomiting. Severe pain in back. Much debility and sense of illness. Fever rapidly abates when eruption appears, followed by secondary. fever. Often symptoms pointing to implication of mucous surfaces.	Slight pyrexia, without special symptoms; or may be no symptoms at all.	No special symptoms at early period, but premonitory symptoms of other exanthemata absent. May be much fever. Often marked rigor before local phenomena appear. Objective signs may be preceded by subjective sensations, as heat, irritation; or by enlargement of lymphatic glands in the neighbourhood. In facial erysipelas may have epistaxis at outset. Severe symptoms during eruption, with tendency to typhoid condition.
generally. First on especially fore-head, preads to trunk and often in three dis- crops on successive Consists of minute ints at outset, soon ing to distinct pa- which tend to form ntic or semi-lunar s; colour darker that of scarlatina. es in same order in 12 hours. Followed ght desquamation; or coppery dis- ion may remain for ime. Much itching.	3rd or beginning of 4th day. First on face, especially on fore-head; spreads over body and limbs in a day or two, often in successive crops. Consists of "pocks" going through stages of:— *a*. small bright-red spot; *b*. hard, shot-like pimple; *c*. vesicle, becoming umbilicated; *d*. pustule, reaching maturation about 8th day; *e*. scab, which leaves reddish brown stain on separation, or a pit. Hard inflamed areola forms. Very variable mode of arrangement and number. Swelling of face, &c. Intense itching. Disagreeable odour given off. Eruption may be on mucous surfaces.	Within 24 or 36 hours. First about shoulders and chest; extends over body and limbs; may be many on scalp, but generally few on face; comes out in successive crops for 4 or 5 nights. First bright-red, slightly papular spots, not hard; in few hours vesicular, large and ill-defined, superficial, not umbilicated, no inflamed areola; do not become pustular, but gradually opalescent, and dry up or rupture 3rd to 5th day. Usually few in number and scattered. As a rule no pitting left.	Usually within 2 or 3 days. Generally on face and head. Signs of rapidly spreading inflammation of skin from a point, usually in some one direction, sometimes equally in all. Much heat, redness, swelling, and tension. Followed by formation of vesicles or bullæ, which rupture or dry up. Subsequent extensive peeling of cuticle. May end in suppuration, ulceration, or gangrene. Inflammation liable to extend after apparently stopping. May assume erratic or metastatic character; or extend to mouth, throat, larynx, &c. May affect limbs or other parts.
ous ascent up to of rash; temp. not above 103°; morn- remissions slight, l, or absent. Defer- ce by rapid crisis, 4th to 10th day. liable to be much ced by complica-	Rapid rise of temperature to 104°—106°. Speedy fall nearly or quite to normal when eruption appears; a second rise as the eruption maturates, varying with the amount of this; temp. reaches 104° or 105° in a typical case. Gradual defervescence. May be another elevation of temperature when desiccation occurs.	No special course. Pyrexia usually slight; may be marked rise of temp. in the evenings.	Very variable course according to part affected. In facial erysipelas rapid rise of temp. When local inflammation appears may reach 104° or 105° on first evening; increases so long as inflammation extends, but usually reaches maximum on 3rd day; may be 106°—108°; generally evening exacerbations, but may be distinct fall. Defervescence usually about 5th or 6th day of inflammation; as a rule by rapid crisis, temp. becoming normal in 12 to 36 hours; may be more gradual. Temp. will rise with relapse or extension of inflammation; and is much influenced by complications.

		TYPHOID FEVER.	TYPHUS FEVER.	RELAPSING FEVER.	SCARLATI
COURSE, DURATION, AND TERMINATIONS.		Continuous. Duration usually from 3 to 4 weeks; rarely beyond 30 days. Most cases end in recovery. No crisis, but defervescence gradual. Convalescence slow, and health liable to remain permanently impaired. Relapse not uncommon.	Continuous. Duration usually from 14 to 21 days. Most cases recover, but mortality varies in different epidemics. Generally marked crisis, followed by deep sleep, and rapid improvement in symptoms. Convalescence usually comparatively speedy. Relapse exceedingly rare.	Peculiar course, viz., sudden crisis usually from 5th to 7th day, attended with profuse sweating and other phenomena, followed by complete or partial cessation of symptoms; from 12th to 17th day sudden relapse, with same symptoms as at first; second crisis generally in from 3 to 5 days; may be a series of relapses. Duration variable. Almost always recovery, but convalescence often very slow, with debility, anæmia, muscular and arthritic pains, &c., as sequelæ.	Continuous. often prolo account of mation. M very variab often high. valescence be retarded ous sequela cially renal with albumin dropsy. Ve relapse.
DISEASES RESEMBLING.	Fevers.	Typhus fever, Relapsing fever, Febricula.	Typhoid fever. Relapsing fever. Measles at early period. Erysipelas. Febricula.	Typhus fever. Typhoid fever.	Measles. Diphtheria. pox in the stage.
	Other diseases.	Acute tuberculosis. Tubercular meningitis. Pneumonia. Pyæmia. Renal disease with uræmia. Gastro-enteritis. Chronic peritonitis with ulceration of the bowels.	Asthenic pneumonia, especially in old, feeble, or intemperate persons. Cerebral or meningeal inflammations. Certain cases of delirium tremens. Blood-poisoning from uræmia, pyæmia, or septicæmia.	Rheumatic fever. Gastric or hepatic affections.	Acute throat mations. Urticaria. Er A rash li of scarlatina times seen i cal cases.
REMARKS.		Cases of typhoid fever are liable to be very obscure, and present considerable differences in their clinical history; care is therefore necessary in diagnosis. When there is *persistent diarrhœa*, always bear in mind typhoid fever, and use the thermometer. Patients may walk about during the entire attack. The most important complications are *perforation of the bowels* and *peritonitis*. More or less bronchial catarrh is always present.	Typhus fever can be generally recognized without much difficulty. It differs from typhoid not only in the points indicated in the table, but also in frequently attacking persons beyond middle life, and being much influenced by unfavourable hygienic conditions, which probably may even originate the disease *de novo*. There is a great liability to *hypostatic congestion*.	Relapsing fever is most liable to be mistaken for typhus at first, but the differences indicated above ought to enable the diagnosis to be made. The two diseases are promoted by the same anti-hygienic conditions. Among the most distinctive complications are *abortion*, and a peculiar form of *ophthalmia*.	Scarlatina several in varieties. Th be no rash at cases may very slight toms; on th hand these of a very m character, e speedy deat ing the d very difficul occurrence o tina may known by de tion taking renal disease in.

DIPHTHERIA. The general symptoms; local throat-symptoms; with satisfactory examination of the throat, will in most cases enable this disease to be recognized. It may at first be mistaken for any form of acute sore-throat, or for scarlatina, extensive thrush, or herpes on the pharynx. In the last-mentioned vesicles may be seen on the fauces, which cannot be removed; the pain is much more severe, but limited; and herpes is visible on the lips. Laryngeal diphtheria resembles croupous laryngitis, and by many authori-

MEASLES.	SMALL-POX.	VARICELLA.	ERYSIPELAS.
Continuous. Duration usually within a fortnight. Most cases recover. Termination generally by rapid crisis. Very rarely relapse.	**Course and duration very variable. Termination fatal in large proportion of cases, about 1 in 3. Recovery is gradual, and convalescence often much delayed.**	**Short duration. Never fatal. Generally speedy recovery.**	**Variable duration. Termination not uncommonly fatal. When favourable, usually marked crisis. Convalescence established in variable time.**
Scarlatina. Rötheln. Small pox (at early stage of eruption). Typhus fever. Influenza (in the invasion stage).	**Febricula. Varicella. Measles (in early stage of eruption).**	**Small-pox.**	**Typhus fever.**
Roseola. Syphilitic exanthem. Flea-bites.	**Lichen. (at early period). Pustular syphilitic eruption.**		**Acute Eczema. Erythema.**
Measles may occur without its eruption, or without its catarrhal symptoms. There are also malignant varieties, difficult to recognize. The diagnosis of *Rötheln* has been sufficiently indicated in the account of that disease, and it has not been thought necessary to consider it in this table.	Small-pox presents many varieties, especially as regards the eruption, and this is greatly modified by vaccination; it is even believed that there may be no eruption; malignant forms of the disease are also met with. Hence diagnosis may be difficult. The greatest difficulty lies in distinguishing mild cases from those of chicken-pox.		Cases of erysipelas are often very difficult to recognize at the outset. The complaint might be suspected if there were febrile symptoms, without any of the premonitory signs of other fevers, or any symptoms pointing to local disease, especially if accompanied with any unusual subjective sensations about the face or other parts; or if lymphatic glands seem to be inflamed. The fact of a patient having had previous attacks of erysipelas may help in foretelling a coming one.

ties these two conditions are regarded as identical. Some asthenic cases may be difficult to recognize at first. A history of exposure to infection may aid the diagnosis.

INFLUENZA is sufficiently characterized by its epidemic character; marked febrile symptoms, with great depression; and catarrhal phenomena. It might be confounded with simple catarrh.

HOOPING-COUGH. In the early stage this complaint cannot be diagnosed with certainty, but it might be suspected if the disease is epidemic: if a child suffers from cough of a violent and spasmodic character; and if there is much pyrexia. Subsequently the peculiar fits of cough, with characteristic expectoration, are usually absolutely distinctive of hooping-cough. In doubtful cases ulceration about the frænum linguæ might help the diagnosis.

Mumps. This affection is also very easily recognized as soon as the peculiar inflammation of the parotid glands sets in, running its special course. It might be mistaken for inflamed lymphatic glands in the neighbourhood. The metastatic inflammations which are liable to arise must be borne in mind.

Glanders—Farcy—Malignant Pustule. When these diseases are fully declared, their diagnosis presents no difficulty. At the outset glanders may be mistaken for acute or subacute rheumatism, but the occupation of the patient might lead to the suspicion of glanders; while in this affection there is more prostration from the first; and the joints are not swollen or red.

Hydrophobia is another quite peculiar disease, the symptoms of which are highly characteristic. The chief liability to error lies in the fact that a patient who has been bitten by a supposed mad dog may be imagining all kinds of symptoms simulating those of hydrophobia, especially if of a nervous or hysterical temperament.

Cholera. During an epidemic of cholera, it is the safest plan to treat any case presenting its characters as being of this nature. The painless purging and vomiting, with "rice-water" stools; cramps; intense thirst; great restlessness; suppression of secretions; rapid collapse; and peculiar appearance of face, are but too significant of the malady. A sporadic case often presents much difficulty, and it may be impossible to determine whether it is on of Asiatic or simple cholera. In simple cholera usually some caus can be found for the attack; it is less severe; the stools an vomited matters contain bile; more or less griping is felt; urin is not entirely suppressed; the duration is longer; and the mor tality is much less. Cholera may set in so violently and under suc circumstances as to simulate irritant poisoning. On the other han intense gastro-enteritis, excited by poison or some other irritan has been mistaken for cholera; and so likewise has the collapse condition resulting from the rupture of a gastric or duodenal ulce

Cerebro-spinal fever is another very well-marked disease, ch racterized by the circumstances under which it arises; its sudde onset; high fever; and symptoms indicative of grave cerebro-spin meningitis. The appearance of herpes, or of purpuric spots ar hæmorrhages, may also assist the diagnosis. The complaint mig be mistaken at first for typhus, typhoid, or relapsing fever; and su sequently for tetanus; but there is more danger of its being co founded with other forms of meningitis.

Dengue—Plague—Yellow Fever—Remittent Fever. T diagnosis of these diseases which prevail in foreign climates ne but little special notice. The symptoms of dengue and plague ha already been sufficiently described. Yellow fever and malar remittent fever may resemble each other, both being frequen attended with a yellow skin, and with black vomit. The points distinction are said to be as follows:—Yellow fever is contagious, has only one paroxysm, and is not periodic; a second attack is very rare; it cannot prevail at a temperature at which malarial fevers are often met with: hæmorrhages and albuminuria are very common, the latter being almost invariable; while quinine has not the influence over the disease which it has in the case of malarial fever. Relapsing fever might possibly be mistaken for yellow fever, but it differs in its course; in attacking chiefly the poor and destitute; in the rarity of black vomit, and comparative infrequency of jaundice; and in being scarcely ever fatal.

INTERMITTENT FEVER in this country is almost always readily recognized by its peculiar paroxysmal febrile attacks, and course of temperature. Some difficulty might be experienced at first in distinguishing a case of ague, where there was no history of malarial exposure, which is not always easily traced, but all doubt ought to be removed by watching the patient for a day or two. Cases of malarial cachexia might afford some difficulty in diagnosis.

B. CONSTITUTIONAL DISEASES.

Chapter XXVIII.

RHEUMATISM.

This term is applied to very different diseases, some of which are entirely of a local nature. For convenience sake, however, it will be expedient to consider all the varieties in the present chapter.

I. Acute Articular Rheumatism—Rheumatic Fever.

Ætiology.—The immediate *pathological cause* of rheumatic fever is the presence in the blood of a morbid material, generated within the system in consequence of some derangement of the nutritive and eliminatory processes. This is generally presumed to be a normal ingredient of one of the ordinary excretions, only accumulated in excess, the common belief being that it consists of *lactic acid.* The results of experiments seem to favour this view, the usual phenomena of acute rheumatism having been produced by injecting this acid into serous cavities. Some authorities believe that rheumatic fever owes its primary origin to some disturbance of the nervous system.

Exciting causes.—The ordinary exciting cause of acute rheumatism is a sudden chill, induced by exposure to cold and wet; sitting in a draught when heated or perspiring; neglecting to change wet clothes; or in other ways. In not a few instances no definite cause can be fixed upon, and it is quite conceivable that processes may be gradually carried on in the system, which tend to generate an amount of the poison sufficient to set up the complaint. Errors in diet, suppression of menses, and various other disturbances have been ranked as causes. Scarlatina seems to lead to rheumatism sometimes, probably by interfering with the excretory functions of the skin.

Predisposing causes.—Acute rheumatism is distinctly a hereditary disease, and it tends to run in families. It chiefly attacks persons from 15 to 35 years old, being especially frequent between 16 and 20, but no age is exempt. Previous attacks decidedly increase the predisposition to the disease. More cases are met with among males, and in the lower classes, on account of their greater exposure to the exciting causes. Climate and season have considerable influence, the affection occurring mainly in temperate but very moist climates, and where there are sudden changes in temperature. It is far less common in tropical and very cold countries. A large number of cases are met with in the eastern counties [illegible] England. The same conditions influence the prevalence of the complaint at different seasons. A state of ill-health from any cause is said to predispose to rheumatic fever, and also ment depression or anxiety; but many individuals are attacked when in apparently perfect health. Joints which are much used, or which have been injured, are particularly liable to become affected.

Anatomical Characters.—The morbid changes associated with acute rheumatism are chiefly evident in connection with fibrous' fibro-serous, or synovial structures. A variable number of the *joints of the limbs* present signs of acute inflammation. The synovial membrane is very vascular, thickened, and relaxed; there may be a deposit of more or less lymph, and the joint contains a moderate quantity of fluid effusion, chiefly serous, but having flakes of fibrin and abundant cells floating in it, the latter often resembling pus-cells. The tissues around the joint are much infiltrated with fluid. In cases of long duration pus may form, and the cartilages sometimes become eroded. The sheaths of tendons may be inflamed, and occasionally they contain a purulent fluid. The muscles are often dark, soft, and infiltrated.

In the majority of cases the morbid appearances characteristic of *pericarditis*, *endocarditis*, or *myo-carditis* are visible. Fibrinous vegetations are common in the heart, even when no inflammation exists. *Pleurisy* and *pneumonia* are also not unfrequently present; and, rarely, *peritonitis*, or cerebral or spinal *meningitis*.

The *blood* contains excess of fibrin, and becomes buffed and cupped during coagulation. The solids generally are diminished, but they are in excess in the serum. It is doubtful whether lactic acid can be detected in the blood.

Symptoms. *Invasion.*—An attack of rheumatic fever may set in gradually, being preceded by a general state of ill-health for some time; but usually the invasion is prominently marked by chills, or occasionally by distinct rigors. These are followed by pyrexia, and soon the joints or other structures become affected.

General symptoms.—When the disease is established, the symptoms are in most cases very characteristic. The patient complains of general soreness and stiffness, and presents an aspect of pain and suffering, combined with restlessness and weariness, but is unable to move, on account of the painful state of the joints, being often quite helpless. Usually there is copious perspiration, the patient being bathed in sweat, which has a peculiarly sour or acrid smell, and is usually very acid in reaction. Sudamina appear not uncommonly, and they may be extremely abundant, coming out in successive crops. There are the ordinary symptoms accompanying pyrexia. The pulse is generally full and strong. The tongue is thickly coated, while there is much thirst, with anorexia, and constipation. The urine is markedly febrile, deposits urates abundantly, and sometimes contains a little albumen. Patients cannot sleep on account of the pain which they suffer, but there are no particular head symptoms as a rule. Occasionally slight delirium is observed.

The general symptoms are not always in proportion to the extent of joint mischief. In some instances they tend to assume a typhoid character.

State of the joints.—It is the *middle-sized* joints which are most commonly attacked in rheumatic fever, viz., the elbows, wrists, knees, and ankles, but the other articulations are by no means exempt. Usually many joints are involved in succession, the complaint showing an erratic tendency, and often the symptoms subside in one articulation as they appear in another, but several may be implicated together. The same joint may be attacked more than once in the course of the disease. A disposition to symmetry in the joints affected is frequently noticed.

An affected joint is more or less red, either uniformly or in patches; swollen and enlarged; and hot. The amount of enlargement varies, and the swelling is due partly to infiltration of the tissues around the joint, partly to effusion into its interior. The skin sometimes pits on pressure. There is considerable pain and tenderness, which is aggravated at night; and any movement causes much distress. In character the pain is dull and aching as a rule, being often so severe as to make patients cry. Frequently the suffering is less intense when the swelling is considerable.

Temperature. The *ascent* usually lasts about a week, but it may be longer or shorter than this. The temperature in most cases ranges from 100° to 104°. The *stationary period* varies greatly in duration; there is generally a considerable difference between morning and evening temperature. *Defervescence* is also gradual and indefinite in most cases, *crisis* being rare. The implicated joints may indicate a higher temperature than other parts. It is in cases of rheumatic fever that hyperpyrexia is most frequently observed, a remarkably sudden rise in temperature taking place, attended with grave symptoms, viz., severe rigors; marked depression; grave nervous symptoms; and sometimes jaundice, diarrhœa, or hæmorrhages; death usually speedily ensuing. The temperature may reach 109°, 110°, 112°, or more, and continues to rise after death. Irregularities in temperature are very common in rheumatic fever, even apart from any *complications*, and the latter are often not indicated by the thermometer in this disease. There is frequently a disproportion between the temperature and the pulse.

A *subacute* variety of rheumatism is by no means uncommon, especially in hospital practice, which is very troublesome. There is but slight pyrexia, and one or more joints continue to be affected for a long time, with but little change, except that occasional exacerbations are liable to occur from slight causes, or even without any evident cause. The joints are not much deformed, nor are they structurally altered to any marked degree. The general condition is usually much below par.

Complications.—In most cases certain internal organs and structures are implicated in the course of an attack of rheumatic fever, and the resulting morbid conditions are ordinarily classed as *complications*, but in reality most of them are *parts of the disease*, and they m exist without any joint-affection. At present they will be mere enumerated, as their symptoms and signs are described in oth parts of this work, but it must be mentioned that they may come very insidiously, and should therefore be constantly watched f especially those connected with the heart, this organ being examined at least twice daily. These complications must necessarily influence greatly the progress of a case of acute rheumatism. They include :—1. *Cardiac affections*, viz., pericarditis; endocarditis, with consequent valvular disease; myo-carditis; and the formation of fibrinous deposits in the cavities of the heart. 2. *Pulmonary diseases*, viz., pleurisy, pneumonia, bronchitis. 3. Rarely *peritonitis*. 4. *Cerebral* and *spinal meningitis* very rarely. The *cardiac* affections are by far the most common, and are especially frequent in the young, being met with in cases of all grades of severity.

Choreiform movements sometimes complicate acute rheumatism; or there may even be a distinct attack of chorea, especially in children. The relation between them is a matter of doubt. It is supposed that the chorea is of *embolic* origin, being due to the plugging of the small vessels of some part of the brain with particles of fibrin, conveyed from the cavities of the heart. Rheumatic subjects are liable to serious inflammations in connection with the eye, viz., *ophthalmia*, *sclerotitis*, or *iritis*.

Duration and Terminations.—The *duration* of rheumatic fever is exceedingly variable, but favourable cases generally become convalescent within from three to six weeks. *Relapses* are frequent. The *termination* in the great majority of cases is in recovery, but permanent organic mischief often remains behind. Sometimes stiffness of joints continues for a considerable period, or they may become chronically affected; they are also liable to subsequent neuralgic pains. Death generally results either from *internal complications;* or from *hyperpyrexia*.

Diagnosis.—Gout is the chief disease from which rheumatism has to be distinguished; the points of difference will be considered under gout. Articular rheumatism has also to be diagnosed from the other forms. Rheumatic fever may be simulated by erysipelas, pyæmia, trichinosis, dengue, or the early stage of glanders. It must be remembered that during an attack of this disease the joints may not be implicated in the least.

Prognosis.—As regards life and death, the prognosis is very favourable in cases of acute rheumatism, but in many instances it is grave with respect to the future condition of the patient, on account of the organic mischief remaining. The chief indications of immediate danger are a very high temperature, or one remaining high for some time; severe nervous disturbance; adynamic symptoms; extensive complications affecting the heart or lungs; cerebral or spinal meningitis; and deficiency of excreta. Chorea is considered to be a highly dangerous complication, especially when accompanied with dysphagia.

Treatment.—The indications which need attention in managing a case of rheumatic fever may be stated as follows :—1. To study the general comfort of the patient, and to protect in every possible way from exposure. 2. To encourage free excretion. 3. To get rid of or neutralize the poison in the blood, if this can be effected. 4. To attend to the joints. 5. To relieve other symptoms. 6. To use every means for preventing complications; and to treat these should they arise.

Of course it is desirable that a patient suffering from rheumatic fever should be restored to health as speedily as possible, but it is a matter of much greater consequence that the attack should be passed through without any permanent organic mischief being left behind, than that convalescence should be established within this or that number of days or weeks.

General management.—The patient should be placed in a comfortable bed, between soft blankets, and should wear a flannel shirt, which must be frequently changed, the limbs being made as comfortable as possible by means of pillows. It is important to avoid anything like a chill, hence the bed should be carefully protected from all draughts, and patients should not be allowed to throw off the bed-clothes, which they are much inclined to do. It is my practice to wrap up all the middle-sized joints, whether affected or not, in cotton wool, and also to place a thick layer of this over the front of the chest. The shirt may be cut in such a way as to make a kind of window over the region of the heart, by drawing aside which this region may be examined without disturbing the patient, or unduly exposing the chest. The wool must be frequently renewed, the surface being dried before each fresh application is made.

The *diet* ought not to be too low, but should consist of a good quantity of beef-tea and milk, regularly administered. Lemonade or barley-water should be freely allowed as a drink, as well as ice to suck. *Alcoholic stimulants* are not required in ordinary practice as a rule; in hospital practice, however, patients often need a little wine or brandy, and sometimes considerable quantities are required, should there be any marked tendency towards debility and prostration. The bowels should be kept regularly opened.

Therapeutic treatment.—Observations have been made by Sir William Gull and Dr. Sutton, as well as by others, with the view of proving that rheumatic fever runs an equally favourable course without medicines, as when these are administered. Possibly this may be true if the measures already mentioned are carefully attended to. At the same time a tolerably extensive experience has convinced me that good results frequently follow the *alkaline treatment.* Whether this treatment shortens the course of the disease or not, it is impossible to say, but it certainly appears to exercise a beneficial effect over the joint-affection, and my belief is that it is decidedly useful in preventing and relieving the cardiac complications. The *bicarbonate of potash* is the preparation which I usually employ, either given in doses of ʒ ½ to ℈ ij every two to four hours; or ℥ ½ or more being dissolved in a quart of barley-water, and administered as a drink during the twenty-four hours. Much larger doses are recommended by some practitioners; while others prefer certain vegetable salts, such as the *citrate* or *tartrate*, which possess the advantage that they can be made into a pleasant drink.

Opium is another remedy of great value. It is best given in the lid form, in doses of gr. ¼—j every three or four hours, accord-g to the indications present. This drug not only relieves pain, ocures sleep, and sustains the nervous system; but it also calms e heart's action, and by thus inducing rest for this organ, tends prevent cardiac inflammations. *Morphia* is also very useful, and may be administered by subcutaneous injection.

Salicine, *salicylic acid*, or *salicylate of soda* are at present in fashion the treatment of rheumatic fever, being administered in doses of . x—xx at intervals of from one to three hours. The conclusions iich I have arrived at from personal experience of the employment these drugs are:—1. That in some cases they are decidedly useful the way of checking the progress of the disease; lowering the nperature; and relieving the joint-symptoms. 2. That they are ore effective in mild than in severe cases. 3. That these drugs terly fail in a good proportion of cases, and therefore can by no eans be implicitly relied upon, and certainly do not possess the most *specific* action in the treatment of acute rheumatism which s been attributed to them. 4. That they are of little or no lue in the prevention or treatment of cardiac complications. That in some instances in which these medicines have failed, kalis have proved undoubtedly efficacious.

Some of the numerous other plans which have been advocated r the treatment of rheumatic fever require notice.

The salts of *soda* are preferred by some practitioners to those of tash. *Nitrate of potash* has been much used, in quantities of from ½ to ℥ i in the twenty-four hours. *Iodide of potassium*, *phosphate of monia*, *benzoates*, and various other salts have also been tried. *mon-juice* has been much recommended, in quantities of from ℥ iij ℥ xij or more in the twenty-four hours. Having seen it em-oyed in several cases, it did not impress me favourably. Some thorities prefer *quinine* or *cinchona bark* in full doses; the former y be conveniently combined with *alkalis*, as advised by Dr. rrod. Dr. Reynolds has found *tincture of steel* efficacious. *Potas--tartrate of iron* has also been well spoken of. Many practitioners e *colchicum*, but this drug is of doubtful value in rheumatism. rtain remedies which act powerfully upon the heart have been ployed, viz., *aconite*, *digitalis*, and especially *veratrum viride*. They y have the effect of diminishing the tendency to cardiac inflam-tions, but require careful watching during their administration. *methylamine*, *tincture of ergot*, and *tincture of actæa racemosa* are ong the remedies which have been recommended in the treat-nt of acute rheumatism.

Dr. Herbert Davies treats acute rheumatism by applying a strip blister around each joint as it becomes affected, this being fol-ed by the application of linseed-meal poultices.

Various *baths* have been much advocated, viz:—the hot-air or our bath; different forms of cold bath; the wet pack; the hot nket bath; or sponging the skin with cold or tepid water.

Local treatment.—If possible it is desirable not to apply anything the joints except cotton-wool, but in some instances the pain is severe that local applications must be resorted to. As a rule warm anodyne fomentations or poultices give most relief, containing *opium*, *belladonna*, or their active principles. To be of any use they must be put on very hot; be well covered with mackintosh; and frequently changed. I have often tried the local application of an *alkaline. solution*, as recommended by some authorities, but in my experience this measure has not appeared to be of much service, unless *opium* is added to the solution. *Cold compresses* have been much commended. Possibly two or three leeches might be advantageously employed occasionally. Free blistering with *liquor epispasticus* certainly not unfrequently gives speedy relief as regards the pain. It is not uncommon for a joint to show a tendency to remain chronically affected after the general symptoms have subsided. If this happens, the application of a blister or of *tincture of iodine* may be first tried, but if a speedy effect is not produced, I have found much benefit from strapping the articulation carefully and efficiently with *ammoniacum plaster*. If there is much effusion, it has been suggested to tap the joint by means of the aspirateur.

Symptomatic treatment.—The management of most of the symptoms which may call for interference in cases of rheumatic fever has been sufficiently indicated in the preceding remarks. The occurrence of *hyperpyrexia* indicates immediate recourse to the employment of *cold*, as described under fever, with *quinine* in full doses nternally, and the free administration of stimulants. The cases successfully treated by Dr. Wilson Fox and others prove that patients may be saved when in an apparently hopeless condition.

The treatment of the several *internal inflammations* will be considered in their respective chapters. At present I will only express the opinion that very rarely is any kind of bleeding justifiable, and *calomel* should never be given. *Opium* must be used with caution if the lungs are involved; and free stimulation is then demanded. In cerebral or spinal meningitis ice should be applied locally.

Much care is needed during *convalescence* from rheumatic fever, warm clothing being worn, with flannel next the skin, and every form of exposure avoided. The *diet* should be improved gradually. The patient should be kept under observation until quite convalescent; and should have full instructions as to how to guard against future attacks.

2. Chronic Articular Rheumatism.

Symptoms.—This affection is common among old persons, usually coming on gradually as age advances, but occasionally following an acute attack. The fibrous structures connected with, as well a around the articulations, become thickened and stiff. Hence movement is impaired, and more or less dull aching pain is felt, whic becomes worse at night, and during damp or cold weather. Ther are no particular objective signs; and the joints are not muc altered in form. Probably this condition may be associated wit chronic changes in the valves of the heart.

Treatment.—Patients suffering from chronic rheumatism shoul wear flannel next the skin; and should avoid exposure to wet o cold, or changes of temperature. Baths of various kinds are useful in different cases, such as warm, vapour, hot-air, Turkish, cold, salt-water, sulphur, or alkaline baths. These may also be employed locally, and douches are often very serviceable. Much good often results from systematic daily friction of the affected joints with some stimulating and anodyne liniment, such as *camphor liniment* with *laudanum*, *tincture of aconite*, or *belladonna;* also from shampooing and kneading. Local counter-irritation by means of *blisters* or *tincture of iodine*, is sometimes beneficial. Good results frequently ensue from effectually strapping an affected joint with some plaster, such as *emplastrum ammoniaci*, *red plaster*, or *Burgundy pitch plaster*. It is always well to keep the joints bandaged. Patients should be encouraged to take a moderate amount of exercise. The local use of the constant galvanic current has proved highly serviceable in many instances.

The internal remedies which yield the best results are *tonics*, such as *quinine*, *cod-liver oil*, or *tincture of iron*. *Iodide of potassium* with *decoction of bark* is also very useful; or the iodide may be combined with *quinine*. *Sulphur*, *guaiacum*, *sarsaparilla*, *actæa racemosa*, and many other drugs have been recommended as specifics in chronic rheumatism. It is often necessary to give some anodyne to relieve pain and to procure rest at night, for which purpose *chloral* is very efficacious. Various mineral waters are in some cases serviceable, such as those of Buxton, Bath, Harrogate, Cheltenham, and some of the German spas. Vichy water may be tried. The *diet* should be nutritious and easily digestible. A small quantity of some alcoholic stimulant is generally beneficial.

3. MUSCULAR AND TENDINOUS RHEUMATISM—MYALGIA.

The muscles are frequently the seat of a very painful affection, supposed to be of a rheumatic character, probably also involving the fibrous structures.

ÆTIOLOGY.—The *exciting cause* of muscular rheumatism is either exposure to cold and wet, or to a direct draught of cold air; or excessive exercise or strain of the muscles. It is usually met with in adults, and some forms of the complaint are most common among labouring men. One attack predisposes to another. Gout seems to increase the tendency to the complaint.

SYMPTOMS.—In most cases the first attack is *acute*, and it often comes on quite suddenly, or sets in during the night. The symptoms are pain in the affected muscles; some degree of tenderness; and considerable stiffness, with difficulty of movement, by which the pain is also much increased. The degree of suffering varies considerably, but it may be intensely severe; sometimes the pain is only felt on moving the affected muscles. In acute cases heat frequently increases it, and it is also worse at night, so that patients suffer most when in bed. Steady pressure in many cases gives relief. There may be a tendency to spasm of the muscles. There are no objective signs, except that it is evident the patient keeps the involved structures as much at rest as possible. Pyrexia is absent, but slight constitutional disturbance may be observed, due to the pain and want of sleep. No tendency exists towards any cardiac inflammation.

In the *acute* form the complaint only lasts for a few days as a rule, but it often becomes *chronic*, or is liable to return again and again. When muscular rheumatism is chronic, heat generally relieves, while cold and damp weather aggravates the pain.

VARIETIES.—Muscular rheumatism may affect the voluntary muscles in any part of the body, and it is even believed that it may attack the involuntary muscles. Its most frequent and important varieties, however, are as follows:—

1. *Cephalodynia* or rheumatism of the scalp, which is attended with a form of headache, increased on moving the muscles, with much soreness on pressure.

2. *Torticollis*, *wry-neck*, or *stiff-neck*.—This is a very common variety, involving the muscles of the neck, especially the sterno-mastoid. Usually it is limited to one side, towards which the neck is more or less immovably twisted, great pain being experienced on attempting to turn in the opposite direction. The muscles at the back of the neck may be implicated.

3. *Omodynia*, *Scapulodynia*, *Dorsodynia*.—These forms are very commonly observed, especially among labouring men, the muscles about the shoulders or upper part of the back being affected.

4. *Pleurodynia* or *Rheumatism of the chest-walls*.—The muscles of the chest are very often implicated, especially those of the left side. The intercostals, pectorals, or serratus magnus may be involved, and it has appeared to me that the pain is frequently seated over the interdigitations of the serratus magnus with the external oblique. It is very commonly situated in the left infra-axillary region. It may be exceedingly intense, and is increased by any movement which brings the muscles into play. Respiratory movements are restrained on the affected side, and such acts as coughing or sneezing cause much distress. Not unfrequently the chief pain is localized in a point, and is of a catching character, while pressure on this point increases it, though diffused pressure with the palm may give relief. In other instances it alters its position from time to time. This affection simulates pleurisy, but is at once distinguished from it by careful *physical examination*. It often comes on as the result of severe cough, and both sides may then be affected; this is frequently observed in phthisical patients.

5. *Rheumatism of the abdominal walls* is an exceedingly painful complaint, and may be mistaken for peritonitis. It not unfrequently results from straining during cough.

6. *Lumbago*.—The mass of muscles, along with the fasciæ, which occupy the lumbar region, are among the most common seats of muscular rheumatism. It may set in with peculiar rapidity, and is usually very severe. Generally both sides are affected. There may be constant aching pain, but this is increased greatly on any attempt being made to bring the muscles into action, and it then becomes of a sharp, stabbing character. The patient keeps the spine quite stiff, and generally a little bent forward; any attempt to stand

erect, or, still more, to get up from the sitting posture, aggravates the suffering greatly. Sometimes the patient cannot stir in bed. Pressure intensifies the pain considerably, and heat produces the same effect in many cases.

In addition to these varieties, muscular pains are common enough in the limbs in different parts. Sometimes cases are met with in out-patient practice, in which the *plantar fascia* and *muscles* seem to be specially involved. The diaphragm is occasionally the seat of a rheumatic affection, which causes much distress. The muscles of the eye-ball may also be affected.

TREATMENT.—In acute cases of muscular rheumatism, the first indication is *to keep the affected muscles at rest*, and in many cases this is all that is required. I treat pleurodynia by firmly strapping the affected side by means of broad strips of plaster extending from mid-spine to mid-sternum (as will be more fully described under pleurisy), and this rarely fails to give complete relief. In lumbago also the application of a wide piece of *emplastrum roborans* firmly across the back, and over this a flannel bandage passing twice round the body, always affords great comfort. In acute cases warm anodyne fomentations are frequently useful, or turpentine stupes. Dry heat does not generally answer well, as it increases the pain, but sometimes if persevered in it does good. Gentle friction is often beneficial. In lumbago the subcutaneous injection of a small quantity of *morphia* generally affords considerable relief. Internally the administration of *bicarbonate of potash* with *iodide of potassium* seems to answer best. An *opiate* may be necessary in order to relieve pain. Exciting free diaphoresis, by administering a warm drink, and then wrapping up the patient in blankets; or by the use of a vapour-bath, in some cases brings about a speedy cure. In rare instances it might be advisable to take away a little blood locally, either by leeching or cupping; or dry-cupping may be advantageously employed.

In chronic cases the internal remedies which do most good are *iodide of potassium*, *quinine*, and *chloride of ammonium*. *Sulphur*, *guaiacum*, *arsenic*, *mezereon*, various *balsams* and *resins* are much used; and likewise *colchicum*, if there is any gouty tendency. Tincture of *actæa racemosa* has been much vaunted in the treatment of lumbago. Flannel should be worn next the skin. Rest, pressure, cold compresses, friction with stimulating and anodyne liniments, the application of sinapisms or blisters, and local baths or douches with shampooing, constitute the chief local remedies which are found efficacious in different cases of chronic muscular rheumatism. The use of the continuous galvanic current is sometimes attended with marked success. It may be advisable to have recourse to subcutaneous injection of *morphia* daily for a few days. Acupuncture; the use of Corrigan's irons; or ironing over the affected part with a common flat-iron, a piece of brown paper being placed next the skin, have proved beneficial in some cases.

4. GONORRHŒAL RHEUMATISM.

Symptoms.—During the course of gonorrhœa, especially in young and plethoric subjects, an affection of the joints is liable to set in as the result of exposure, the knee-joint being that most commonly attacked. The ankles, the joints of the feet, or the hip-joint are also not unfrequently implicated. There is considerable pain, with a tendency to much effusion and exudation, which gives rise to great tension and swelling, but suppuration does not occur. The inflammation is very apt to recur, and to lead to permanent changes in the affected joints, which may remain stiff for a long time, with a crackling sensation on movement; or destruction of the cartilages and subsequent anchylosis may ensue. This complaint may become chronic. It is often accompanied with much constitutional disturbance.

Treatment.—The affected joints must be kept at rest, and well fomented. When the knee-joint is implicated, the limb should be extended on a splint, as it is apt to become bent. In the acute stage *Dover's powder* must be given, in addition to the ordinary remedies for gonorrhœa. Afterwards *iodide of potassium* is useful, with *tonics* and *stimulants* if the patient is weak. Friction, shampooing, and passive movement of the joint must be carefully practised when the acute symptoms have subsided. It might be useful to strap the articulation.

5. RHEUMATOID ARTHRITIS—ARTHRITIS DEFORMANS.

Ætiology.—This is a curious form of joint-inflammation, which is liable to bring about great deformity. It occurs in those who are debilitated, and whose circulation is languid. Most cases are met with between 20 and 40 years of age, and among females. The complaint is chiefly observed among the poor, who live badly; but it may attack those who are in the best of circumstances. It is often attributed to cold or damp, or sometimes to injury, but there may be no obvious cause. It is doubtful whether the affection is at all hereditary.

Anatomical Characters.—At first rheumatoid arthritis is attended with redness of the synovial membrane of the implicated joints, and increase of synovia. After a time the capsular ligament becomes greatly thickened, irregular proliferations forming; while the synovial fluid is much diminished. The internal ligaments may be destroyed, leading to dislocation. Fibrous bands form within the articulation, and cartilaginous or bony masses may grow there. The interarticular fibro-cartilages break down and disappear, as well as the cartilages covering the ends of the bones, the latter becoming smooth and eburnated to a greater or less extent, being also enlarged, sometimes considerably, and either regular or more commonly very irregular, owing to the growth of osseous protuberances. There is no trace of any deposit of urates.

Symptoms.—Rheumatoid arthritis may be *acute* or *chronic.*

rmer case several joints are involved, but there is no erratic cy, such as is observed in ordinary rheumatic fever. Py- is present, but there is no profuse sweating, nor does the show any disposition to become implicated. In the *chronic* y one joint is first affected, being the seat of a little pain and ng, but it soon recovers; in a short time the same articulation in attacked, and remains permanently altered, becoming grad- worse. Other joints are subsequently involved in succession, ll those of the limbs may finally be observed in various stages ange, and even the temporo-maxillary and upper cervical lations may become implicated. They become rigid, motion- nd either permanently bent or extended; there is more or istortion and nodulation, with contraction and wasting of the es, the patient being finally completely crippled. At first may be signs of fluid in a joint. In some cases dislocation place. The pain may be very considerable, being sometimes nely severe, especially at night. There are no special consti- al symptoms, but the patients are often weak, anæmic, and g in tone. The hands are usually crippled before the feet. e former also little nodular thickenings of the epiphyses of the ges—*digitorum nodi*—are sometimes met with, especially in ction with the terminal phalanges, which are generally sup- to be due to rheumatoid arthritis, but others believe them to a gouty nature.

er parts are occasionally involved in this disease, viz., the tic, internal ear, or the larynx.

GNOSIS.—Rheumatoid arthritis has to be distinguished from from acute or chronic articular rheumatism; and from rhœal rheumatism. The marked structural changes and de- y distinguish the complaint from ordinary chronic rheumatism, ll as from the gonorrhœal form, the latter also having a dif- history. The diagnosis from acute rheumatism and gout will nted out after the latter affection has been considered.

GNOSIS.—Acute cases may recover if properly treated. If the e is chronic and advanced, some improvement may be ef- , but not much as a rule.

ATMENT.—Patients suffering from rheumatoid arthritis need a ing plan of treatment, which must be persevered in. The al health requires every attention; the *diet* must be very nutri- nd easily assimilable, and wine or some other form of *alco- imulant* is decidedly beneficial. Warm clothing, an equable e, some pleasant occupation, and moderate exercise, with daily are also to be commended.

, *quinine*, and *cod-liver oil* are the most efficient internal reme- *Syrup of iodide of iron*, *iodide of potassium*, *arsenic*, *guaiacum*, *e of actæa*, and many other medicines have been favourably n of. *Strychnine* or *nux vomica* may be tried if the muscles vasted to any marked degree. Different mineral waters and are sometimes beneficial, such as those of Bath and Buxton. arly cases local counter-irritation is decidedly useful, but it ot produce much effect after a time. In a case under my care free bathing with salt and water, followed by friction, seemed to do most good. Systematic strapping of the joints, friction, with various liniments, shampooing, and careful passive movement may also be attended with benefit. Galvanism might prove of service in some cases.

CHAPTER XXIX.

GOUT—PODAGRA.

ÆTIOLOGY.—Gout is a markedly hereditary complaint, and this is partly shown in its development at an early period of life. It is rarely met with under 30 years of age, except in hereditary cases; most first attacks occur between 30 and 35, and the disease does not often commence late in life. Males suffer much more frequently than females. Those who are of sanguine temperament, plethoric, and corpulent are most subject to the disease; but thin, nervous, and wiry persons are also liable to be attacked. Individuals who work in lead are decidedly prone to become gouty, and, on the other hand, gouty people readily suffer from lead-poisoning. Gout prevails chiefly in cold and temperate climates, especially in those which are at the same time damp and changeable. Spring is the most favourable season for gouty attacks, and then autumn.

The combination of circumstances most conducive to the development of gout is indulgence in certain alcoholic drinks; along with excessive consumption of food, especially animal food; and deficient exercise, with general luxurious habits. The disease is in this way frequently produced *de novo*, being also considerably more prevalent among the better classes of society; as well as among publicans, butchers, butlers, and others who are able to indulge in these habits. There is a form of "poor gout," which is met with in persons who drink much beer, while at the same time living badly as regards food, but a hereditary tendency may be discovered in some cases of this class.

Wines and malt liquors are more conducive to gout than spirits. Port-wine stands first, then come burgundy, madeira, marsala, and sherry. The lighter wines are not so hurtful. Rum is said to be a frequent cause of gout. Sweet and unfermented cider is also believed to produce the complaint.

The *pathological cause* of gout is now generally believed to be the presence of excess of *uric acid* in the blood, in the form of *urate of soda*, this substance being generated in excess, in consequence of indulgence in the habits mentioned above, while the kidneys are unable to excrete this excess. During an acute attack uric acid may be detected in abundance in the blood-serum; and in long-continued chronic cases it may be obtained from this fluid at any time. It is also found in the fluid of blisters; in inflammatory serous effusions; and in dropsical accumulations.

The *exciting cause* of a gouty fit may not be evident, but it is often traceable to some definite cause, such as exposure to cold or wet;

slight injury to a joint; excessive exertion and fatigue; undue mental labour; violent or depressing emotions, such as rage or grief; over-eating or drinking; or indulgence in indigestible food.

ANATOMICAL CHARACTERS.—Gout is characterized by the deposit of urate of soda from the blood in various structures, especially in those entering into the construction of the joints, and in such tissues as are not very vascular. This deposit is accompanied with signs of inflammation. In an *acute* case there is increased vascularity, along with swelling, and effusion into and around the affected joint. Even in the first attack a deposit probably takes place, and this increases with each subsequent paroxysm. In the early period only the metatarso-phalangeal joint of the great toe is usually affected, but subsequently other articulations become involved, so that almost the whole of them may be finally implicated. The deposit first occurs in the superficial part of the cartilages, in the form of fine crystalline needles or prisms, forming a more or less close network, and presenting different degrees of opacity. Subsequently the fibro-cartilages, ligaments, and synovial membranes become involved, the entire surface being more or less irregular, and covered with white, chalky-looking deposits, consisting of urate of soda. The synovial fluid may also contain crystals of the same substance. Owing to the infiltration of the ligaments, the articulations become stiffened or anchylosed. In long-continued cases the joints become ultimately greatly distorted and nodulated, and the skin over them may be destroyed, exposing the chalky-looking masses, and leading to unhealthy suppuration and ulceration. The periosteum and various bursæ may also be implicated; and some believe that even bone itself may become affected.

Deposits are often found in various other parts, such as the external ear, eyelids, nose, or larynx.

The kidneys become the seat of certain morbid changes, which probably begin at an early period. At first a deposit of urates forms within the renal tubuli, which afterwards extends into the intertubular tissue. White streaks are seen in the direction of the tubuli of the pyramids, and at the extremities of the papillæ. Ultimately the organs become greatly contracted and indurated; at the same time being the seat of extensive deposit. This condition of the kidneys will call for more detailed description when the diseases of these organs are discussed.

SYMPTOMS.—Cases of gout are divided into two classes, according as the symptoms are associated with the joints—*regular* or *articular* gout; or with some internal organ—*irregular* or *misplaced* gout.

1. *Regular* or *Articular gout.*—At first this is an *acute* affection, but after a time it tends to become *chronic.*

a. Acute gout.—The first attack often comes on without any premonitory warning, but not always, and prodromata usually indicate the approach of subsequent fits. The most frequent precursory signs are derangements of the alimentary canal, with heartburn, acidity, and signs of portal congestion; palpitation of the heart; nervous disturbances, such as headache, giddiness, disturbed vision, drowsiness and heaviness, irritability of temper, languor, restless sleep with unpleasant dreams, starting of the limbs, or cramps in the calves of the legs or in other parts; asthmatic attacks; profuse sweats; and changes in the urine, this secretion either becoming scanty and depositing abundant sediment, or being very abundant and watery. These symptoms are supposed to result from the presence of the gouty poison in the blood. In some cases the patient feels unusually well, both mentally and bodily, before the occurrence of an attack. This may be preceded by some uncomfortable local sensations in connection with joints.

The onset of the attack usually takes place during the night, especially from 2 to 5 A.M. In the large majority of cases the *metatarso-phalangeal articulation of the great toe* is the joint which is first affected, generally on one side, but sometimes on both, or they may be attacked in succession. In some instances this joint is alone implicated during several attacks, but in most cases other articulations soon become involved, a number of them being affected during a gouty fit, either simultaneously or in succession, though the complaint tends to be limited for a considerable time to the smaller joints of the feet and hands. Exceptionally the knee or ankle is first affected, but very rarely the larger articulations of the upper extremity.

Characters of the joint-affection.—The subjective sensations are extremely severe. The pain rapidly increases until it becomes agonizing and unbearable, being described as burning, tearing, plunging, boring, or piercing. There is exquisite tenderness, so that the slightest touch cannot be endured. These sensations are usually much worse during the night, and remit during the day. Soon the joint becomes red and hot, and is much swollen, owing to effusion of fluid into its interior, the skin over it being tense and shining, and after a while there is considerable œdema, with pitting on pressure, some relief accompanying these objective signs. The superficial veins are also enlarged. As the inflammation subsides, desquamation of the cuticle takes place, and troublesome itching is often experienced. Œdema may continue for some time.

It is in early attacks, and in full-blooded persons, that the phenomena above described are most marked. Subsequently the pain and other symptoms become greatly diminished; and in weakly individuals, especially females, the characters of the joint-affection are not nearly so prominent.

Constitutional symptoms of greater or less severity are present during a paroxysm of gout, being in proportion to the intensity of the local symptoms, and to the number of joints involved. Chills or even distinct rigors are felt at the outset, followed by pyrexia, usually attended with perspiration. Marked remissions are generally observed towards morning. The urine is very scanty and dark, and deposits urates abundantly, of variable colour; uric acid is actually deficient, though relatively in excess. The patient is very restless and sleepless, and not uncommonly suffers from cramps in the legs. The digestive and hepatic functions are much deranged. At the close of the paroxysm there may be critical perspiration, diarrhœa, or abundant sediment of urates in the urine.

The *duration* of a gouty fit varies from four or five days to several weeks, in the latter case being interrupted by remissions or intermissions. It becomes more prolonged as the case progresses. *Recurrence* is a characteristic feature of gout, though it does not invariably happen. At first the attacks generally come on once a year, in the spring; then twice, in spring and autumn; and afterwards at more frequent intervals.

Some patients do not recover their usual health for a considerable time after a fit; others are much the better for it. In a short time the affected joints become the seat of permanent changes.

b. Chronic gout. This term is applied to those cases in which the joints have become permanently much altered in structure and form; and where the attacks are frequent, as well as chronic in duration and intensity, indeed in some instances being never altogether absent; while at the same time other structures besides the joints are involved. The articulations become stiff, immovable, enlarged, nodulated, and deformed, owing to the extensive deposits of urates in their structures. The skin appears blue and congested over them, the veins being enlarged. Finally it may rupture, masses of urate being exposed, named *chalk-stones* or *tophi*, which may be discharged as a yellowish-white substance; or suppuration and unhealthy ulceration may be set up.

In course of time other structures are affected, such as tendons, bursæ, the periosteum covering the shafts of bones, aponeuroses, and the sheaths of muscles. Gouty abscesses may form in connection with these deposits. Small deposits may also be observed in the helix of the external ear, the cartilages of the eyelids, the nose, and the sclerotic. At first they are liquid, and when punctured a whitish matter is discharged, containing abundant crystals of urates; ultimately they become solid, and form little hard nodules or beads. These gouty concretions sometimes set up inflammation, and hence they are not always of uniform composition; a little phosphate of lime may be mixed up with the urates.

Patients suffering from chronic gout are almost always weak and wanting in tone. They may have a pale and sallow aspect; or are sometimes plethoric, but flabby-looking. They suffer from various disorders of digestion; as well as from disturbances about the heart, in the way of palpitation or irregular action; being also irritable or depressed and restless, and subject to cramps, twitchings, tic douloureux, and other nervous disorders. A peculiar grinding of the teeth has been noticed in gouty subjects. From time to time there may be a little feverishness. The urine is generally pale, of light specific gravity, deficient in solids, and often slightly albuminous; it sometimes contains casts, in consequence of permanent disease of the kidneys having been established. The skin is frequently the seat of various eruptions, such as urticaria, erythema, eczema, psoriasis, prurigo, and acne. In some cases the nose is subject to daily paroxysms of heat and redness.

2. *Irregular*, *non-articular*, *misplaced*, or *retrocedent gout.*—These terms are associated with gout when it attacks internal parts instead of the joints, which it may do from the outset; or it is sup-

posed that it may recede suddenly from the joints, and involve internal organs by a kind of metastasis, being then specially called *retrocedent.* The chief complaints usually attributed to the gouty diathesis are as follows:—

a. Nervous disorders, such as severe headache and vertigo; mental disturbance, the intellect being impaired, or delirium or mania setting in as the result of retrocedent gout; epileptiform seizures; various neuralgiæ and other morbid sensations; startings of the limbs, cramps, or local paralysis. It is believed by some authorities that gout may set up a form of meningitis. Apoplexy is common among gouty subjects, but this is probably due to the fact that the vessels are generally diseased in such persons. A gouty form of sciatica has been described, due to implication of the sheath of the sciatic nerve, which may extend up to the spinal cord and its membranes, and thus lead to their destruction.

b. Derangements of the digestive organs. The stomach is one of the organs most commonly affected in gouty persons. There may be actual gastritis; or merely a neurotic disturbance, indicated by sudden spasmodic pain, of great intensity but relieved by pressure, with a sense of oppression, great anxiety and distress, and sometimes marked prostration or collapse. Dysphagia is occasionally complained of. In some cases intestinal colic and diarrhœa are associated with gout. Signs of disorder of the liver are often evident.

c. Cardiac disturbance. There is no true gouty cardiac inflammation, though white patches on the pericardium, and changes in the valves, are frequently observed in chronic cases of this complaint. The heart's action is, however, liable to become gravely disordered at times, being either weak, or very slow or rapid, or irregular or intermittent; while at the same time the pulse is feeble and small, and there may be a tendency to syncope or collapse. Painful or disagreeable sensations are also experienced over the cardiac region, accompanied with a feeling of constriction, dyspnœa, and much anxiety.

d. Pulmonary affections. A form of asthma is often met with in gouty patients, and also bronchial catarrh, which is attended with much cough. Pulmonary congestion may arise, but pneumonia is very uncommon.

e. Urinary complaints. The changes in the kidneys have been already alluded to. Chronic cystitis and urethritis are not infrequent, especially among old people. Gouty persons often suffer from gravel and calculus; and oxaluria is observed in many cases.

DIAGNOSIS.—The chief points of difference between gout, rheumatism, and rheumatoid arthritis are indicated in the following table:—

	Gout.	Rheumatism.	Rheumatoid Arthritis.
litariness	Very marked.	Less marked.	Doubtful.
l position atient . .	Among the better classes; or those who over-feed and drink.	Among the poorer and hard-working classes chiefly.	Among the poor and ill-fed.
. . . . . .	Very rare in early life. Most first attacks from 30 to 35.	Common in early life; chiefly from 16 to 20.	Usually from 20 to 40.
. . . . . .	Much more prevalent among males.	More among males, but to less degree.	Chiefly among females.
of onset.	Often no obvious cause of first attack: this is frequently preceded by digestive derangements, and other premonitory symptoms.	Usually follows an obvious cause, viz., exposure to cold; and frequently no precursory symptoms are observed.	Exciting cause may be evident or not. Preceded by much exhaustion and debility in some cases.
-affection	The smaller joints are most affected, especially the great toe; no erratic tendency. Local symptoms very intense, with much œdema, a shining appearance of the skin, enlarged veins, and desquamation after the attack. In time permanent enlargement of the joints, with distortion, and deposit of urates.	Medium-sized joints most involved; erratic, several joints being usually attacked in succession. Symptoms less severe, and less œdema present than in gout; no enlargement of veins or desquamation.	All joints equally attacked; not erratic. Symptoms are not severe, but tend to long continuance. Ultimately deformity is produced, but there is no deposit of urates in joints.
'al symp- s	Pyrexia, variable in amount; much constitutional disturbance; considerable morning remissions.	Variable degree of pyrexia, but usually considerable; more continuous than in gout.	Only slight pyrexia. Symptoms of debility, and want of tone.
'iration. .	No special characters.	Very profuse and acid.	No acid sweats.
:e, dura- , and pro- s	Early paroxysm of short duration; great tendency to recurrence, and to periodicity.	Attack of much longer duration; much less tendency to recurrence; not periodic.	Subacute and gradually progressive; often no complete intermission; not periodic.

	GOUT.	RHEUMATISM.	RHEUMATOID ARTHRITIS.
10. *Complications*	Affects especially the stomach, brain, and kidneys; also gives rise to nervous disturbance of the heart, but not to inflammatory affections.	Very liable to cardiac inflammations; also to pulmonary inflammations.	Nothing in heart or other organs.
11. *Uric acid in blood*	Present.	None.	None.
12. *Tophi in auricle, &c.* . . .	Present.	None.	None.
13. *Urine*	Deficiency of urates before and during the fit, followed by excess; albuminuria common; may have casts, indicating kidney disease.	Febrile; sometimes slight albuminuria.	No special characters.

PROGNOSIS.—Acute gout is rarely immediately fatal, but when the disease attacks internal organs there is considerable danger. The complaint is always liable to return, but much depends upon the mode of living which the patient adopts. The prognosis is worse in proportion to the youth of the patient; to the degree of hereditary tendency; and to the frequency of the attacks. Chronic gout decidedly shortens life. The most serious signs are those indicating advanced renal disease, with non-elimination of uric acid. Gout materially diminishes the chances of recovery from acute diseases and injuries.

TREATMENT.—1. *During the paroxysm.*—It is well to give a brisk purgative at the commencement of a fit of gout, such as a *calomel* and *colocynth* pill, followed by a *black draught*. *Colchicum* is the specific remedy for this affection, but it must be given with due care. From ♏x—xx of *vinum colchici* should be administered every six or eight hours, and it may be combined with the *bicarbonate* or some vegetable salt of *potash*, freely diluted; or with *carbonate of lithia*.

A free action of the skin should be kept up by the use of *diaphoretic* drinks; or the vapour or hot-air bath might be employed in some cases. A low *diet* is generally indicated at first, which should be gradually improved as the attack passes off, but it may be necessary to permit weak patients to have a good quantity of liquid nourishment. As a rule all stimulants ought to be withdrawn, especially when the patient is young, but sometimes it is advisable to allow a certain quantity of brandy, well-diluted. If there is much pain and restlessness, *opium* must be given at night, in the form of *Dover's powder;* or subcutaneous injection of *morphia* may be had recourse to.

As regards *local treatment*, rest is of course essential, and an elevated position should be adopted for the affected parts. These should be wrapped up in flannel or in cotton-wool, covered with oil-silk. If the local symptoms are very severe, warm fomentations or poultices containing *opium*, or localized steaming may be tried; or it may be advisable to apply anodynes, such as *belladonna liniment*, *tincture of aconite*, or a solution of *atropine* or *morphia*. Local removal of blood is extremely rarely called for; but sometimes the application of a blister is useful. As the inflammation subsides, slight pressure by means of a bandage or an elastic stocking is often serviceable, in order to get rid of the œdema and other conditions which are liable to remain; gentle friction may also be employed.

Irregular gout.—Should gout attack internal organs, it is requisite to endeavour to excite inflammation in the joints, by means of friction, heat, or sinapisms. In the neurotic affections, *opium* with *stimulants*, such as *ammonia*, *ether*, *camphor*, and *musk*, are the remedies indicated; as well as *alcoholic stimulants*. External heat or sinapisms are also of much value in these conditions. Inflammatory complications may require the application of a few leeches or of a blister, but in most cases gouty patients will not bear much depletion.

2. *During the intervals.*—There is no disease in the management of which a careful study of the patient, and of everything connected with him, is more necessary than in the case of gout. In the early stage a practical cure may often be effected, especially in acquired cases, in so far that freedom from further attacks can be ensured, provided that due attention is paid to certain rules. Even when the gouty diathesis is hereditary, it may be prevented from becoming actively developed, or at all events the complaint can be put off until a later period in life, by the exercise of proper care and precautions.

Diet requires strict regulation, but must necessarily vary much in different subjects. The food should be nutritious and easily digestible, consisting of a due proportion of animal and vegetable matters, but the consumption of nitrogenous and saccharine substances must be limited. Moderation in eating, and regularity of meals, are important points to be attended to. Tea and coffee may be allowed to a limited extent; also soft and stewed fruits, provided they do not contain much sugar; but pastry ought to be avoided. Abundance of pure water is of great value as a drink.

The use of *alcoholic stimulants* is a matter calling for serious consideration. For young persons who are hereditarily predisposed to gout, total abstinence is to be decidedly recommended, as well as for other gouty subjects when there is no obvious necessity for stimulants. The nature and quantity of any stimulant which is permitted should be always definitely stated. Malt liquors and all strong wines ought to be rigidly denied. Lighter wines of good quality, such as claret, hock, moselle, or chablis, may be allowed in moderation; or in some cases a small amount of dry sherry. Small quantities of spirits, freely diluted, are also permissible in some instances, either brandy, whiskey, or gin, and these may be taken mixed with good potass or lithia water. When a change is being made as regards the diet and drink of a gouty patient, it should be carried out gradually, and not abruptly.

With respect to *general hygienic management*, the following are the chief matters which need to be enforced:—Moderate daily exercise in the open air, and the avoidance of sedentary habits; proper ventilation; daily bathing, followed by friction, and the occasional use of a warm, Turkish, or tepid salt-water bath; the wearing of warm clothing, with flannel next the skin; abstinence from undue mental labour, and freedom from all sources of worry or irritation; the avoidance of late hours at night, of heated and ill-ventilated rooms, and of lying in bed late in the morning; if possible, residence in a warm and equable climate, but if this is not practicable, protection against all sudden alterations of temperature or exposure to wet and cold, with a change to a favourable climate during the winter months. Wet-packing and other forms of hydropathic treatment are decidedly useful in some cases.

The *digestive organs* must be attended to. The bowels should be acted upon daily, a mild *aperient* being given if necessary. Much mercury is injurious, but there is no harm in giving a little *blue-pill* occasionally. It may be requisite to administer remedies with the view of improving digestion; or of relieving portal congestion.

Mineral waters are often useful, but must be duly regulated in their administration. Those which are considered most beneficial include the waters of Buxton and Bath in this country; and various German waters, especially those of Vichy, Wiesbaden, Baden-Baden, Aix-la-Chapelle, Carlsbad, Kissingen, Marienbad, Homburg, Ems, and Wildbad.

It is scarcely necessary to add, that every cause should be avoided which is known to have any tendency to bring on an acute attack of gout.

Therapeutic treatment. *Colchicum* is a valuable medicine even in the intervals between the attacks of gout, when carefully administered; it is best given in the form of *extract* at night, with *extract of henbane* or *gentian;* or a few minims of *vinum colchici* may be added to other medicines. In a great proportion of cases *tonics* are indicated. *Quinine*, or *tincture* or *infusion of cinchona;* some mild preparation of *iron*, such as the *citrate; arsenic; mineral acids;* and *bitter infusions* are frequently serviceable. *Guaiacum* and *ammoniacum* are strongly recommended for asthenic gout in old persons. *Iodide* and *bromide of potassium* are also beneficial in some cases. *Alkaline salts* and those of the *alkaline* earths are valuable in many cases, given freely diluted and on an empty stomach, especially the *carbonates* and *phosphates of potash, magnesia*, or *lithia*. The salts of *lithia* have been specially advocated, either the *carbonate* (gr. v—x), or the *citrate* (gr. viii—xii). Most of the mineral waters owe their efficacy to some of these salts being dissolved in them. *Carbonate of alumina, benzoate of ammonia, phosphate of soda and ammonia, lime-juice*, and various other medicines have also been recommended in the treatment of chronic gout.

Local treatment.—When the joints become much altered, but little

n be done locally. I have, however, seen much benefit derived,
cases not far advanced, from the continued application of wet
ndages over the affected joints. Friction, shampooing, and pres-
re by means of strapping might be carefully employed. Ulceration
quires the application of some simple dressing. A dressing of a
lution of a *potash* or *lithia* salt has been favourably spoken of.

CHAPTER XXX.

SCORBUTUS—SCURVY.

TIOLOGY.—Scurvy is a distinct and peculiar disease, though the
rm is not uncommonly ignorantly applied to a variety of skin-
fections. It is met with chiefly among seafaring men, being conse-
ently by far most commonly observed on board ship, or in the
spitals of seaport towns. During the early part of my connection
th the Liverpool Northern Hospital a large number of cases
re admitted within the year, but subsequently they became less
merous, owing to better regulations being carried out for the
evention of the disease.

Scurvy has been attributed to many causes, among others to the
e of salt meat, or of putrid meat and bad water, and to imper-
t hygienic conditions; my own experience, however, would lead
to agree with those who believe that the complaint is almost
vays due to the *want of fresh vegetable diet*, or of some appropriate
bstitute. This was the invariable cause in the seamen in whom I
served the disease; and in four cases of *land-scurvy* which have
me under my notice, the complaint could be distinctly traced to
same cause. Scurvy seems, however, to have broken out under
cumstances which indicate that it might possibly arise in other
ys. During the siege of Paris numerous cases of the disease
curred, which were attributed to insufficient food and bad hy-
enic conditions.

In what manner deficiency of vegetable matter acts is not definite-
known, and all that can be stated with certainty is, that it leads to
me alteration in the composition of the blood. This change has
en attributed to a want of potash salts, vegetable albumen, vege-
ble acids, and various other constituents.

Advanced age; a cold and damp climate or season; exposure;
tigue; and despondency, have been set down as *predisposing
uses* of scurvy.

ANATOMICAL CHARACTERS.—In fatal cases much emaciation is
sually observed, with œdema of the legs. The blood is very
ark and liquid, and its colouring matter stains the tissues. Ex-
avasations are met with in the subcutaneous tissue, as well as
etween, or sometimes even within the muscles, and they are often
mly coagulated or partially organized. Serous and synovial ef-
sions are common, especially pericardial effusion, these frequently
ntaining an admixture of blood. The organs are loaded with blood,

and present ecchymoses and extravasations, being also relaxed and softened. Ecchymoses may be seen under the serous membranes; while the mucous membranes are red and swollen in some parts. Fatty degeneration of the muscles is said to occur. The appearances which are characteristic of scurvy during life continue to be visible after death.

SYMPTOMS.—Scurvy sets in gradually and insidiously, and cases are met with of all grades of severity, but in a well-marked example the symptoms are very striking. The patient presents a peculiar unhealthy aspect, the face being sallow and of a dirty-yellowish hue, combined with puffiness about the eyelids, and anæmia, the latter being well seen in the mucous membranes. There is more or less emaciation, but wasting may not be very marked even in bad cases. The subjective sensations are those of languor, debility, fatigue, shortness of breath, faintness, pains and soreness in the limbs, mental depression and despondency. These symptoms vary in degree, sometimes amounting to complete prostration, with a tendency to sudden syncope, which may even prove fatal.

The *mouth* affords certain characteristic signs. The gums are either more or less swollen, turgid, dark, and spongy, sometimes reaching to, or even much beyond the level of the teeth; or they become ulcerated and gangrenous, dropping off in masses, and exposing the teeth or jaws. From the first they readily bleed, and after a time blood oozes constantly from them. The teeth feel very tender, so that chewing becomes impossible; and they also soon become loosened, or even drop out. Necrosis of the jaws occasionally occurs. The breath has a peculiar and excessively foul odour.

The *legs* present small purple spots, corresponding to and being the result of extravasations of blood into the hair-follicles. They are chiefly observed below the knees, but are not uncommon, though less abundant, on the thighs, being rarely seen on the abdomen or arms. In addition to these petechial spots, more or less extensive irregular ecchymotic patches are visible, presenting various hues, according to the changes which the colouring matter of the extravasated blood has undergone. Brawny indurations can be felt, due to deeper extravasations, especially in the hams and calves, and these are often very painful and tender. Œdema of the feet and legs, and desquamation of the cuticle, are common symptoms. There is much stiffness and pain in movement; while a constant feeling of aching and contusion in the legs is experienced.

In some cases *hæmorrhages* take place from various mucous surfaces. *Ulcers* are occasionally formed; or old ulcers may break out anew, or assume an unhealthy aspect, being covered with large bleeding granulations. It is said that old fractures sometimes become disunited; that bones soften; or that epiphyses become separated.

The *alimentary canal* is usually out of order. The appetite is impaired as a rule, though sometimes patients feel inclined for food, but cannot chew, and certainly the appetite generally returns as soon as they are able to masticate. In severe cases there may be nausea and vomiting. Obstinate constipation is the rule, but occasionally the bowels are relaxed, and the stools may contain blood, or actual dysentery may be present as a complication. There is no pyrexia usually. The pulse is infrequent, weak, and small. The patient often passes restless nights. The urine is deficient in quantity, dark-coloured in some cases, and tends to decompose rapidly. Urea, phosphates, and potash are deficient. Occasionally blood is mixed with the urine.

Morbid conditions of the *blood* have been described, but there is no certainty about this matter. Garrod states that potash is much diminished in quantity. Dr. Leven affirmed that in cases in which he examined the blood during the siege of Paris, he found fibrin in excess, and corpuscles diminished by one half.

Diagnosis.—The only disease likely to be confounded with scurvy is purpura; the diagnosis will be pointed out after the latter has been considered.

Prognosis.—All the cases of *sea-scurvy* which came under my notice rapidly recovered, with one exception, and in that case death resulted from an accidental complication, viz., apoplexy. Therefore the prognosis is highly favourable, if proper treatment can be adopted. In my experience sporadic cases of *land-scurvy* do not seem to be so easily cured, and in one instance acute gastro-enteritis and pneumonia set in without any evident cause, ending in speedy death; while in another no treatment seemed to produce any effect, and the patient sank from the direct consequences of the disease, death being preceded by high pyrexia.

Treatment.—Sea-scurvy is one of the most satisfactory diseases to treat, speedy recovery being brought about in the great majority of cases, provided the necessary remedies can be obtained, viz.; plenty of fresh, soft, and succulent *vegetables*; with from ℥ iv to ℥ viij of *lime-* or *lemon-juice* daily. Potatoes and cabbages constitute the best forms of vegetables. Oranges, lemons, citrons, and other fruits of this class are also most valuable. Water-cress, garden-cress, mustard, scurvy-grass, sauer-kraut, spruce, fir, and various other vegetable growths have obtained repute in the treatment of scurvy, and might be tried if the more reliable remedies cannot be procured. It is stated that vegetables act best when uncooked, but ordinarily it is quite unnecessary to give them in this condition.

Liquid nutritious food is needed, such as beef-tea and milk, often in considerable quantity, and as soon as the patient can chew, meat should be allowed. *Stimulants* are frequently indicated, but should be given carefully, and in small quantities. In a few days it is advisable to administer some *tonic*, such as *quinine* and *tincture of iron*, which aids recovery by exciting the appetite, strengthening the patient, and improving the quality of the blood.

The mouth must at first be frequently washed out with some dilute *antiseptic*, of which one of the best is *Condy's fluid*. At a later period a mild *astringent*, such as a solution of *alum*, may be used. Constipation is generally a troublesome symptom, and is best treated by *enemata*. Fomentations may be applied to the painful swellings in the legs. If serious hæmorrhage occurs, *astringents* must be given. Ulcers may be dressed with *lime-juice*, but they improve rapidly under its internal administration.

Many remedies have been recommended in the treatment of scurvy, such as salts of *potash;* solution of various *vegetable acids*, especially *citric;* and *phosphoric acid.* In my experience they are quite unreliable. *Raw meat* and *seal's flesh* have also been employed, it is said, successfully.

The *prevention* of scurvy is a most important matter in connection with those persons who lead a seafaring life. There can be no question but that the disease may be completely prevented by the use either of *fresh vegetables*, *preserved vegetables*, or of *proper lime-* or *lemon-juice*, which should be served out daily. Many of the specimens of so-called lime-juice used on board ship are worthless; often only a solution of citric acid is used, which decidedly does not prevent the disease. The free employment of *vinegar*, and of the vegetable salts of *potash*, has been recommended. It is important to attend to all hygienic and other measures for maintaining the general health of the sailors; and also that they should avoid undue exposure.

CHAPTER XXXI.

PURPURA.

ÆTIOLOGY.—Purpura is due to a peculiar unhealthy condition of the blood and tissues, which may probably be originated in many ways, but its causes are not at all clearly defined. The disease is quite distinct from scurvy. It may depend upon unhealthy hygienic conditions, deficiency of proper food (? vegetables), or intemperance and other lowering agencies; or it may arise in connection with various acute fevers, or in the course of many chronic affections, such as albuminoid disease, syphilis, cancer, Bright's disease, or cirrhosis of the liver, while it often accompanies jaundice. Sometimes the condition follows the administration of iodide of potassium. Purpura may affect persons apparently in perfect health, even in its worst forms. Amenorrhœa has been stated as a cause. The old and young are most liable to be affected.

ANATOMICAL CHARACTERS.—Purpura is characterized by rupture of the capillaries, and escape of blood in various parts, indicated by petechiæ and ecchymoses in connection with the skin; hæmorrhages from mucous, and sometimes from serous surfaces; and extravasations into the cellular tissue or muscles, or into certain organs, such as the brain, lungs, and pelvis of the kidneys. Organs are often found in a diseased condition, this being the cause of the purpuric state. The blood may be quite normal; or dark and fluid. The cutaneous capillaries are usually healthy, but there is reason to believe that they sometimes undergo structural degenerative changes.

SYMPTOMS.—Purpura is described under two chief forms, *purpura* *simplex* and *purpura hæmorrhagica.* In the former the hæmorrhages are only observed in connection with the skin; in the latter they also take place from mucous surfaces, as well as sometimes into serous cavities, or into the substance of organs, while the cutaneous hæmorrhages are generally more abundant.

The *skin* presents various forms of extravasation, viz., minute points or stigmata; petechiæ; vibices; and extensive ecchymoses. These are observed chiefly on the legs, and may appear in successive crops, each crop lasting a variable number of days. Their occurrence is often favoured by much standing. From their first appearance pressure produces no effect on the colour, which is often bright-red at the outset, but afterwards becomes darker, changing to purple, violet, or almost black in some cases. The usual alterations in colour are seen as the extravasations disappear. The spots are generally roundish, and have a well-defined outline at the commencement, but subsequently they gradually fade into the surrounding skin. They are not at all raised, but there is often hardening and swelling of the subcutaneous tissue. Blebs containing sanguineous serum sometimes form under the cuticle; and in rare instances the skin becomes actually gangrenous.

The *hæmorrhages* from mucous surfaces which may be met with are epistaxis, hæmorrhage from the gums and mouth, hæmatemesis, melæna, hæmaturia, hæmoptysis, and menorrhagia. In rare instances bleeding takes place from the ear. Extravasations may also escape into the mucous membranes, such as the conjunctiva, or the membrane covering the palate, cheeks, or gums. Little blisters containing bloody serum sometimes form on the tongue or cheeks. Extravasation into organs is rare, but death has occurred from pulmonary or cerebral apoplexy in exceptional cases.

The *general symptoms* vary much, and are considerably modified by the conditions under which the purpura arises. There are often premonitory symptoms for some time, such as general pains, languor, and debility, but not always. The attack may be ushered in by pyrexia, and occasionally febrile paroxysms of a hectic type have been noticed. Pains in the abdomen, especially the epigastrium, loins, chest, and limbs are often complained of. The digestive organs may or may not be impaired in their functions. There is always more or less debility and sense of depression, and in severe cases this becomes extreme, being accompanied with marked anæmia if much blood has been lost, and a tendency to faintness or syncope. The pulse is usually feeble, quick, and compressible. The urine may be albuminous, independently of the presence of blood, and sometimes this fluid contains casts.

Purpura has a very variable *duration*, being either *acute* or *chronic* in its progress. It usually terminates in recovery, if uncomplicated.

Varieties.—In addition to the *varieties* already mentioned, the following are described:—1. *Senilis*, which is met with in old people, owing to degeneration of their vessels, and especially on the exposed and irritated arms of old women. 2. *Rheumatica*, occurring in rheumatic individuals, and attended with much pain. 3. *Urticans*, where *purpura simplex* accompanies urticaria. 4. *Papulosa*, which is merely a form of lichen. Petechiæ may be observed in connection with a number of skin-diseases.

Diagnosis.—Scurvy is the main disease from which purpura has to be diagnosed. It might possibly be mistaken for ecchymosis from injury; flea-bites; typhus fever; or the hæmorrhagic form of measles. This complaint must also not be confounded with the *hæmorrhagic diathesis*.

In addition to the difference in the *ætiology* of the two diseases, purpura not being due to the want of vegetable food, and the use of this class of diet or of lime-juice not having any material influence in its cure or prevention, scurvy presents the following characters which distinguish it from purpura:—1. The peculiar colour and sallowness of the skin. 2. The state of the gums. 3. The greater extent of the ecchymotic patches. 4. The presence of brawny indurations in the substance of the limbs, accompanied with much pain and stiffness. 5. Extensive desquamation of the cuticle.

Prognosis.—The prognosis of purpura will depend greatly on its cause, and especially whether it is associated with any organic affection. The *hæmorrhagic* variety is very dangerous, but I have known recovery take place, apparently spontaneously, when all treatment had failed, and the case had been given up as hopeless. The *simple* form is often very tedious in its progress towards recovery; and it is also liable to return.

Treatment.—In the first place it is necessary to enquire into all *hygienic conditions*, and improve these if they have been at fault; at the same time giving a *nutritious diet*, consisting of both animal and vegetable constituents, alcoholic *stimulants* being also in many cases required in moderation.

Rest in the recumbent posture is generally advisable; or at any rate the legs should be kept up. Attention must be paid to any cachexia present; or to any organic disease on which the purpura may depend. If there is much plethora, *saline purgatives* may be given at the outset.

The chief remedies employed for the cure of purpura are *tincture of iron* in full doses; *turpentine; tincture of larch bark;* and *arsenic;* The first mentioned is most useful, and it may be combined with *quinine* and *dilute sulphuric acid.* In the *hæmorrhagic* form, *gallic* or *tannic acid, alum, ergot of rye, acetate of lead,* or subcutaneous injection of *ergotine* might prove serviceable. Other astringents may also be freely administered, but they often fail to produce any effect. Local astringents, pressure, and cold, especially by means of ice, may be tried where their application is practicable. Careful bandaging of the legs, or the use of elastic stockings is advantageous in many chronic cases of simple purpura.

Chapter XXXII.

RACHITIS—RICKETS.

tiology.—Rickets is a very prevalent disease in this country, d the out-patient practice of any hospital presents a large pro-rtion of cases of this complaint. It is unquestionably a *general* or *nstitutional* disorder, and can in the large majority of instances be aced to some obvious cause or combination of causes, leading to perfect nutrition.

This complaint always sets in during infancy or childhood, espe-ally during the first or second year. It is not a congenital dis-se, and rarely appears before six or seven months after birth; t it may commence as late as seven or even nine years of age. me authorities believe that rickets is hereditary, but in the great ajority of instances this is certainly not the case. Early mar-ages, intermarriage, and ill-health or advanced age of the father ve been set down as causes, but on no sufficient evidence; nor rickets a mode of development of tuberculosis or syphilis. A rge proportion of cases of rickets occur in children who have en brought up by hand, either throughout or from an early riod, and who have been improperly fed artificially. Prolonged ckling is sometimes the cause of the complaint, the milk becom-g unfit for proper nourishment; or too frequent suckling, so at the digestive organs are deranged, and the food is not duly similated. The state of health and general nutrition of the other has also a material influence in the causation of this dis-se, through the milk, and hence all imperfect hygienic conditions, ficiency of food, chronic diseases, and other agencies which im-verish the blood and undermine the health of the mother, tend produce rickets in the child. Unfavourable sanitary conditions so directly assist in the development of rickets, especially want fresh air and sun-light. In some instances it appears to depend on some previous debilitating disease, particularly gastric and teric catarrh, with long-continued diarrhœa.

Occasionally a child becomes rickety in the midst of a family, t if one is affected, those who follow generally also suffer from e complaint. Among the poorer classes it is very common for ll the children after the second or third to be the subjects of this sease. Rickets is far less frequently met with in country places d small towns than in large towns and cities.

Anatomical Characters and Pathology.—The *bones* present the ief morbid changes associated with rickets. These changes con-st in an increased growth or proliferation of the epiphyses and riosteum; accompanied with delayed, imperfect, and irregular ssification. As a consequence the ends of the long bones become reatly enlarged; the flat bones are thickened, especially at their rowing edges; while all the bones are softened, and hence cur-atures and angular deformities arise, leading to more or less dis-rtion.

The degree of enlargement of the epiphyses varies considerably, and there is much difference in the relative amount of this alteration, and of the softening of the bones. They are increased chiefly in breadth, not because the growth takes place laterally, but on account of the pressure and muscular action to which they are subjected. The layer of cartilage in which ossification normally proceeds is abnormally developed, and the cancellous tissue of the bone is increased. The material is very soft, and a quantity of red pulp can be expressed, consisting of fat, nucleated cells, and blood-corpuscles.

The shafts of the long bones may be so softened that they can be easily bent or cut with a knife or scissors; the periosteum is vascular and thickened, owing to the formation of a tissue similar to that from which bone is normally produced, and this is especially noticed at the line of junction between the bone and cartilage. Pathologists hold very different views as to the original cause of this softening of the shafts. Some believe that there is at first an absorption of the calcareous matter already deposited, as well as impeded ossification; probably, however, there is no such absorption, but the old bone disappears from within in the ordinary course of events, as happens in health, while the newly-formed external material which takes its place does not undergo proper ossification. Much red pulp is contained within the medullary canal and the various interstices of the bone.

Some important deviations are observed as regards the mode of deposit of the calcareous matter during the progress of ossification. Instead of there being a tolerably regular line where calcification is proceeding at the junction of the bone and cartilage, such as is normally observed, this line is very unequal, the calcareous matter in some parts shooting far up into the cartilage, portions of which may also become completely isolated, and in advanced cases there are often distinct spots of calcification. Some of the cartilage-cells are very large, and Kölliker and others describe them as being directly converted into lacunæ, as the result of a deposit of calcareous matter in their walls, canaliculi forming at the same time. Sir William Jenner states that the calcareous matter is deposited within the cells, which may become completely filled, the process in fact being merely one of petrifaction.

Another abnormal condition noticed is, that the medullary cavity passes into or beyond the line of ossification; while distinct spaces form in the epiphyses, which may contain a fibrous vascular stroma, resulting from fibrillation of the interstitial tissues, around which calcification takes place.

The flat bones are similarly altered, being thickened owing to periosteal formation, especially near their growing edges, as well as softened, and they consist chiefly of diploë containing much red pulp.

The chemical composition of rickety bones becomes greatly altered; the organic matter is markedly in excess, being in some instances in the proportion of 79 to 21 of inorganic constituents while neither gelatin nor chondrin can be obtained.

Certain obvious changes arise as the result of the altered structure of the bones. The spinal column and long bones are bent and twisted, producing often much deformity. The chest and pelvis are peculiarly distorted. Where a long bone is bent, its medullary cavity is narrowed, and may become ultimately completely closed by callus. Partial or complete fractures are not uncommon, but the periosteum remains uninjured.

The skull is large; its sutures remain long ununited, and its fontanelles open; while the bones forming it are especially thickened at a little distance from their edges, so that the sutures appear grooved, with a little elevation on either side. In some parts the bones may be thinned, or in exceptional instances even actually perforated, so that the periosteum and dura mater meet.

Should the rickety process subside, the enlargement of the epiphyses diminishes, and they often ossify rapidly, growth of the bones in length being thus interfered with, leading to the production of dwarfs. The shafts also become firm, remaining permanently more or less deformed. The head continues to grow, and often becomes very large.

The tissues generally are relaxed and wanting in tone in rickety children, and all structures connected with bones are arrested in their growth. The muscles become small, pale, and flabby.

Important *internal morbid conditions* are frequently met with, which need only to be enumerated at present. These are:—1. Collapse and emphysema in various parts of the lungs, in connection with the deformed and weak thorax. 2. Bronchial catarrh or extensive bronchitis. 3. Pleurisy. 4. White patches on the pericardium and spleen, due to the distorted chest. 5. Albuminoid disease of most of the organs, and sometimes involving all the absorbent glands, but especially the mesenteric glands. 6. Chronic hydrocephalus, either meningeal or ventricular. 7. Enlargement of the brain, due either to albuminoid infiltration or to increase of the neuroglia, and not to true hypertrophy. 8. Gastro-enteric catarrh.

PATHOLOGY.—The pathology of the morbid conditions observed in rickety bones is by no means agreed upon. Some believe that the proliferation of the epiphyses and periosteum is primarily due to an inflammatory process; and that the resulting disturbance of circulation prevents the deposition of calcareous salts. Others think that the calcareous matters are not supplied in sufficient quantity. A third view is that these calcareous salts are either absorbed, or are prevented from being deposited, owing to the presence of excess of lactic or some other acid in the blood, which keeps them dissolved, and they are then excreted by the kidneys. Sir William Jenner is of opinion that there is no deficiency of lime salts in rickets, but merely a malposition.

SYMPTOMS.—At an early period the symptoms of rickets are often very indefinite, the onset of the disease being insidious. Generally there is marked disturbance of the alimentary canal, with some degree of pyrexia, the pulse being quick and irritable. The child alters in disposition, becoming dull and sad, or peevish and irritable, and is languid, refusing to play or to be amused. It may cease to walk if this act has already been commenced; or will not show any signs of making the attempt. At the same time wasting is observed, the tissues becoming flabby, and the face pale. These and other non-characteristic symptoms may be present, but there are three signs which Sir William Jenner looks upon as pathognomonic, namely:—1. *Profuse sweating* about the head, neck, and chest, especially during sleep, attended with enlargement of the veins, the other parts of the body being often at the same time hot and dry. 2. *General soreness* and *tenderness* of the body, so that the child cries on being touched, or even on the approach of anyone; cannot bear to be washed; and keeps quite still, avoiding every movement. Older children do not suffer so much, but only complain of pains in the limbs. 3. *Throwing off the bed-clothes at night*, in order to try to get cool. At this time also the urine may be very copious; and it may contain abundant calcareous salts or phosphates.

Sooner or later the *changes in the bones* are revealed, and in out-patient practice it is generally found that these are more or less obvious when a child suffering from rickets is brought to the hospital. The enlarged ends of the bones can be distinctly seen or felt, so that the joints appear swollen and knobby, especially those which are least covered, such as the wrists and ankles; and they also have a loose feeling. A string of nodules is usually felt along each side of the chest, at the junction of the ribs with their cartilages. The limbs may be variously distorted and curved, as well as the clavicles, which often exhibit two bends; the spine is curved and deformed, and in many cases also the pelvis and chest. The chest-deformity is described in the chapter on PHYSICAL EXAMINATION, but the limits of this work forbid a description of the various other distortions met with, which differ according to the movements carried on by the patient, the mode in which the child is supported and carried, the ordinary position assumed, and the age at which the disease sets in; these deformities result from pressure and gravitation, and not from muscular action. In some cases the enlargement of the joints is most evident; in others the distortion of the limbs attracts most attention.

The *head* and *face* present well-marked characters. The head is large, and has a long antero-posterior diameter, with a high, square, and often projecting forehead; the anterior fontanelle remains unclosed much beyond the ordinary period; and in many cases the sutures are open and grooved, a thickening being felt on each side. In some parts, and especially over the occiput, the bone may be very thin or entirely absent, but this last condition is very rarely met with. The hair on the scalp is generally thin. The face looks small but broad, and is often turned up, owing to the head being thrown back or sinking between the shoulders. It assumes a staid, sedate, or pensive expression, and becomes "old-looking." The teeth appear very late, in many cases none having come through at the end of a year or more; while they also rapidly decay or fall out, being deficient in enamel.

The *general symptoms* advance with the progress of the disease.

Emaciation, flabbiness of tissues, debility, and loss of power are more or less marked, the child being sometimes completely helpless, and unable to sit up or move in the least, the head dropping in any direction. The skin often becomes thick and opaque, and covered with downy hairs; while profuse sweating continues. The alimentary canal is more or less deranged, and there is often much flatulency, giving rise to enlargement of the abdomen. Hectic symptoms may set in. Development and growth are arrested more or less, the body remaining short and stunted.

Much difference of opinion exists as to the state of the *intellect* in rickety children. Many believe that the mental powers are above par, but this is certainly not the case, although they may appear to be very precocious, and are often amusing; in some instances they become stupid, or even almost imbecile, this being evident in the expression of the face. Rickety children are late in beginning to talk.

The *urine* is pale and abundant; contains an excess of earthy phosphates and lactates; and sediments of oxalate of lime often form. Urea and uric acid are said to be deficient. Calculi are not uncommon in connection with rickets.

During the course of rickets symptoms indicative of the *complications* already mentioned frequently appear. Among the most common and the most dangerous complications are *bronchitis* and *gastro-enteric catarrh*. *Laryngismus stridulus* and *general convulsions* are also very liable to occur. If death happens, this event is generally due to one of these complications; but it may be the mere result of the cachexia attending the disease.

Cases of rickets present all grades of severity and advancement. When a favourable termination ensues, the symptoms gradually subside; strength is restored; and the bones ossify, though usually more or less permanent distortion remains, which, however, may frequently be greatly diminished by appropriate treatment. Children who have suffered from rickets in a marked form rarely attain the ordinary height.

Diagnosis.—In a well-marked case of rickets the diagnosis presents no difficulty, but in its earlier stages the malady is not so easily recognized. It should always be borne prominently in mind among the diseases of children, especially of those belonging to the poorer classes in large towns, though it must not be forgotten that the complaint may also be met with among the better classes. Should there be any reason to suspect rickets, enquiry must be made with regard to its more characteristic early symptoms; and the history of the mode in which the child has been fed may also help the diagnosis. Delayed dentition, or the fact that a child shows no disposition to walk, not uncommonly first draws attention to the presence of rickets.

Prognosis.—Most cases of rickets may be cured, if taken at a sufficiently early period, and treated properly. Its complications are very serious, and the presence of rickets adds materially to their gravity, especially in the case of chest-affections. The thoracic and pelvic deformities which it originates may prove very injurious.

Treatment.—The first matter requiring attention in the treatment of rickets is the feeding of the child, which is almost always at fault, and about which thorough enquiry should be made, with the view of correcting anything that may be wrong. The breast should only be taken at regular stated intervals, and for a certain time; or the child should be weaned if suckling has been too long-continued, or may be partially artificially fed. Often the health of the mother requires to be improved. The feeding of children artificially needs the greatest care in this disease. *Milk* mixed with a fourth part of *lime-water* should constitute the principal article of diet, to which may be added a little cream and milk-sugar. This combination must be given in regulated quantities, and the feeding-bottle should be kept scrupulously clean. It is a common custom to give young infants considerable quantities of arrrowroot, cornflour, and various artificial foods of a farinaceous character, and these certainly do much harm. Only a very small quantity of such articles should be allowed. Ass's and goat's milk are useful if they can be obtained. For older children, beef-tea in small quantities and milk-puddings are valuable; and at a still more advanced period they may have a small amount of pounded meat, or be allowed to suck a piece of underdone beef, or be given the juice pressed out of this. Potatoes well mashed with gravy may also be permitted in moderation. All indigestible substances must be avoided.

Hygienic management also demands special attention. The ventilation of the bedroom must be looked to, and the child should have a separate bed, if possible, which must be kept very clean and dry. After the early symptoms have subsided, the patient should be a good deal out of doors whenever weather permits, in the sun, a dry bracing air of moderate temperature answering best. The clothing must be sufficiently warm, and the common custom of inadequately covering the lower part of the body in children ought to be avoided. A change to the seaside is very beneficial. The body should be washed over twice a day with warm water; and later on warm salt-water bathing, followed by friction, is useful. It is important to look to the position assumed by the child, and also to the movements carried on, so as to prevent deformity. Straight wooden splints lightly applied along the legs, and extending a little beyond the feet, are of use for the purpose of preventing the child from attempting to walk. The abdomen should be well supported by a bandage. Any distortion of the limbs must be removed, as far as possible, by systematic efforts to straighten them.

Therapeutic treatment.—It is almost always necessary to treat the alimentary canal in cases of rickets, as this is usually out of order. A combination of *rhubarb* with *carbonate of soda*, *magnesia*, or *chalk* answers very well, and an occasional dose of *castor-oil* may be given. *Grey powder* is useful now and then, when the stools are offensive, but should not be administered as an habitual thing. *Lime-water* also improves the condition of the stomach and bowels. *Alkalies*

bitters are recommended by some practitioners. At a later
e the two great remedies are *cod-liver oil* and some preparation
on, care being taken that the limbs are straight before these
administered. The former should be taken after meals, in
ll doses. In the case of infants it may also be rubbed into the
-pits, and a flannel moistened with some of it may be worn
r the abdomen. The best preparation of *iron* is *steel-wine*, but
rs are useful, especially the *tartrate*, *ammonio-citrate*, *syrup of the*
phate or *iodide*, or *Parrish's food*. *Chalybeate waters* are also of
ice. Sometimes it is advisable to combine *quinine* with the *iron*.
hen any inflammation arises in rickety children, lowering mea-
s are not well-borne, but supporting treatment is indicated.
yngismus stridulus requires *tonics* and *baths*. The slightest sign
ronchial catarrh ought to receive immediate attention, as rickets
lers this complaint extremely dangerous, while it aids materi-
in producing deformity of the chest.

Chapter XXXIII.

CONSTITUTIONAL SYPHILIS.

e present chapter it is not intended to give a full description of
ilis, but merely to sketch an outline of the course of the affec-
as it results from *direct inoculation*, with the constitutional effects
induced; and to consider the phenomena presented by *congeni-*
yphilis.

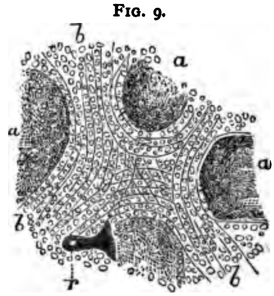
PHILIS FROM DIRECT INOCULATION.—Syphilis is classed by many
orities along with the specific fevers, the differences observed
g supposed to be due to its prolonged course. As a *primary*
ase it can only be transmitted from one individual to another
irect inoculation or *contact*. This produces a *specific sore*, having
indurated base, with but little tendency to suppuration, the
hbouring lymphatic glands being also hard and somewhat
rged. Then follows a *period of incubation*, of from one to three
ths duration, at the close of which *secondary symptoms* arise.
se are preceded and accompanied by some general disturbance,
cated by languor; pains in the bones and joints, especially at
t; debility and loss of flesh; slight pyrexia; impaired digestion;
a tendency to anæmia. The *secondary symptoms* consist of:—1. A
neous eruption, of very variable character, being either a mere
a, papular, scaly, vesicular, pustular, bullous, or tubercular. It
ally presents a coppery tint, and is most marked in the bends of
limbs. 2. Ulceration of both tonsils, the ulcers being grey,
uptly-cut, scarcely at all painful, and without any tendency to
ead. 3. Enlargement of the glands of the neck, especially of
se situated behind. 4. Superficial inflammation of the mucous
ng of the mouth, tongue, palate, pharynx or larynx, sometimes
h slight ulceration. 5. Mucous tubercles or condylomata in

connection with the tongue, angles of the mouth, pharynx, larynx, anus, penis, labia, and other parts. 6. Loss of the hair, which becomes dry and thin. 7. Onychia. 8. Iritis or retinitis, these being rather late phenomena. 9. Slight and transient periostitis, especially on the cranium. More or less of these morbid conditions may be present, and this stage lasts from six to twelve months usually, but may in rare instances extend to eighteen months or longer. Secondary lesions exhibit a remarkable tendency to symmetry.

After this succeeds a period, differing greatly in duration in different cases, during which there are either no symptoms at all, or only occasional slight cutaneous eruptions are observed, or little ulcers on the tongue or lip. This interval is in many cases followed by *tertiary symptoms* or *sequelæ.* The chief pathological tendencies of tertiary syphilis are to produce certain lowly-organized growths, of the nature of fibro-plastic, fibro-nuclear, or fibroid tissue, which are prone to suppuration or ulceration.

Many growths are met with in tertiary syphilis which merely result from proliferation of ordinary connective or fibroid tissue, and which present the characters of this tissue, but those which are peculiar to syphilis constitute what are termed *gummy tumours* or *gummata;* there is, however, no marked line of demarcation between these two kinds of growths, both often existing together, and the former becoming converted into the latter. Gummata are not of the nature of an exudation, but result from hyperplasia of the connective-tissue elements previously existing, this process beginning in the walls of the vessels, the new elements invading the normal tissues, and being mixed up with, or displacing them. At first gummata are soft, translucent, greyish-white, and almost homogeneous; but afterwards they become firmer, tough, yellowish, opaque, non-vascular, and caseous-looking, owing to degeneration and gradual drying-up of their structure. On section they often present a central yellowish mass, or several yellow spots, surrounded by a translucent fibrous layer, which sometimes looks like a capsule, but this cannot be separated from the surrounding tissues, into which it gradually passes. Gummata vary much in size, and some of the larger masses seem to be formed by the union of smaller nodules. In structure they resemble at first granulation-tissue or embryonic connective-tissue, consisting of an amorphous matrix, with minute spherical or ovoid finely-granular cells, enclosing obscure nuclei. The matrix becomes fibrillated more or less; while many of the young elements degenerate, and ultimately break down into mere granules of fat and cholesterin, which are

FIG. 9.



Gummy growth of liver. a. Central portions of growth, consisting of granular débris. *b.* Peripheral granulation tissue. *r.* A blood-vessel. X 100 (After *Cornil* and *Ranvier*).

imbedded in a small amount of fibrillated stroma. These several stages may be seen in the same growth, the central yellowish portion of the nodule being that which is most advanced in the process of degeneration. A few vessels are present in the recently-formed tissue, but these subsequently disappear.

These growths may be absorbed more or less completely; or their fibrous stroma may be left, which tends to shrink, giving rise to deep cicatrices or seams; or in certain structures they are liable to suppurate or to ulcerate. Several tissues and organs are often implicated at the same time, this being one of the prominent characteristics of syphilitic deposits.

The chief morbid conditions which are liable to be met with in *tertiary syphilis* may be enumerated as follows:—1. Skin-eruptions and ulcerations, viz., erythema and psoriasis of the hands and feet; or ulcerations originating in tubercles, subcutaneous gummata, or syphilitic lupus. These ulcers are of a horse-shoe or kidney-shape, and spread in a serpiginous manner. 2. Ulceration of the pharynx and palate. The ulcer may commence at any point, often starting simultaneously in two or more places. It is unsymmetrical, and spreads very irregularly and deeply, causing much destruction of tissues, and forming an excavation with hard borders. It often extends to the larynx, thus inducing very dangerous symptoms; or it may even reach the œsophagus. When cicatrization takes place, much induration and contraction often result, which may lead to serious obstruction. 3. Induration of the tongue, followed by hard, well-defined, unhealthy, painful ulcers. 4. Ulceration of the rectum occasionally, accompanied with dysenteric symptoms, and very apt to be followed by stricture. 5. Growths in, or ulceration of the larynx, the latter almost always beginning on the epiglottis, and presenting the usual syphilitic characters. The cicatrix following a syphilitic ulcer in this part is firm, pink, shining, retracted, and surrounded with growths, hence causing serious interference with breathing. The laryngeal cartilages often necrose. 6. Fibroid thickening of the trachea and larger bronchi, leading to diminution of their calibre. 7. Gummata in the subcutaneous tissue, or "cellular nodes," most frequent among females, and generally observed on the legs, being either single or multiple. These finally form ulcers. 8. Inflammation of a bursa, especially that over the patella, followed by ulceration. 9. Gummata in the voluntary muscles, often forming indurated tumours. 10. Periostitis and disease of the bones. Periosteal nodes form chiefly over the tibia and skull, sometimes in large numbers, but they may be observed over almost any bone. They are usually attended with severe pain, especially at night, and feel very sore and tender. They may undergo absorption, ossification, fibrous development, or suppuration; or they may become truly gummatous. Syphilis often originates caries or necrosis of bones, portions being exfoliated, and much destruction of tissues being thus caused. This is not uncommonly seen about the nose, palate, and skull, and it may set up intercranial inflammation. I have met with several instances of syphilitic caries of the ribs leading to pleurisy. Syphilitic caries presents a peculiar worm-eaten appearance. 11. Enlargements of the testicle, due to gummata. 12. Chronic enlargement of the lymphatic glands, with but very slight tendency to suppuration. 13. Gummata or fibrous growths in internal organs, especially the liver and nervous centres; or, not unfrequently, albuminoid disease or fatty degeneration. 14. Growths in the placenta, leading to abortion or miscarriage, which event may also happen from the direct effects of the syphilitic poison on the ovum.

The different morbid changes just enumerated are accompanied with more or less *constitutional cachexia;* and they necessarily give rise to *local symptoms* corresponding to the part affected. In tertiary syphilis the lesions present no tendency to symmetry.

CONGENITAL OR HEREDITARY SYPHILIS.—Syphilis affecting the infant is occasionally evident at birth, and various internal lesions may be developed in the fœtus *in utero*; more commonly, however, the disease is not manifested before from three weeks to a month or two after birth, and very rarely it is revealed as late as six months. In a well-marked case the appearance of the child is highly characteristic. There is great emaciation, with anæmia, all fat having disappeared, while the muscles feel flabby, the skin hangs in loose folds, and growth is retarded. The face has a peculiar shrivelled, aged, decrepit look, which is particularly seen when the child cries; being also dark, opaque, and earthy or muddy-looking. The nose is often broad or depressed. The entire skin feels dry, harsh, rough, and inelastic; and the cuticle desquamates. Various cutaneous eruptions are liable to break out, which tend to be of a moist character; among the most frequent of these is a dull-red or coppery, shining, erythematous condition of the palms and soles; of the surface around the anus; and of the thighs and genitals. Roseola, lichen, psoriasis, eczema, impetigo, ecthyma, or pemphigus may be observed. Small yellowish patches sometimes form on the skin, like hard scales, which on separating leave superficial ulcers. The hair is often very deficient; and the nails grow slowly, being also prone to ulceration. The mucous membranes may be either inflamed; or the seat of tubercles or condylomata; or ulcerated. The mouth is hot and swollen, and the lips are fissured. Among the most characteristic phenomena of congenital syphilis are a peculiar hoarse, cracked cry; and snuffling, with nasal discharge, which tends to clog the nostrils, and interferes with breathing. Ulcers may be visible about the nose, the angles of the mouth, the anus, or the labia. Mucous tubercles are also frequently observed about the mouth and anus; on the labia or scrotum sometimes; near the umbilicus; or in the larynx. Condylomata are occasionally present. Discharges from the eyelids or ears are not uncommon. Occasionally iritis or some other inflammatory affection of the eye is set up. Syphilitic children are more liable to serous inflammations than others. Nodes very rarely appear, but they are apt to be numerous when they do form. The internal organs may be implicated. In exceptional cases there are well-marked evidences of congenital syphilis without any particular emaciation or anæmia.

Mr. Hutchinson has drawn attention to some important distincons between *congenital* and ordinary *constitutional* syphilis. He ates that in the former the secondary and tertiary phenomena metimes occur together, but the secondary are then not well-arked; as a rule, however, there is a considerable interval be-veen them, the child apparently recovering more or less completely, hile tertiary symptoms do not set in until between five years of age nd the time of puberty, or even later. In the meantime the health ay be good, but the aspect of the patient is hardly ever satisfactory, hile growth and development are sometimes much retarded. As ecial *secondary symptoms* of congenital syphilis Mr. Hutchinson men-ons diffuse stomatitis without ulcers, and diffuse inflammation of the ucous membrane of the nares; and among *tertiary symptoms* a rm of phagedenic lupus, and interstitial inflammation of the rnea or keratitis. Deafness and amaurosis are also stated to be r more common in the inherited disease, but paralysis of single rves is not observed. Another point of difference is that in all its ages congenital syphilis tends to exhibit symmetry.

The *teeth* are sometimes very peculiar in congenital syphilis. he incisors of the temporary set are cut early, but are of bad lour, and crumble away speedily, especially the upper central. he same teeth of the permanent set are of bad colour; short, rrow, peggy, and deformed; rounded at the angles; separated an interval, or turned towards each other; while the edges are gged or present a vertical notch, with sometimes a shallow groove nning up to the gum in front and behind. The canines may be milarly affected.

It has been suggested that the virulent character which scarlatina metimes assumes in individuals or in families during a mild epi-mic may be the result of a syphilitic taint.

There are certain important points bearing upon the *transmission syphilis* to which it is here necessary to allude. It seems certain at the disease may be communicated to the mother through the tus, usually only tertiary symptoms being then produced, and ese are not of a severe character. There is reason to believe at the taint may be transmitted to a third generation. Probably philis may be originated by the milk of a syphilitic nurse; and me authorities believe that, on the other hand, a syphilitic child ay infect the nurse.

DIAGNOSIS.—It is only intended here to offer a few remarks re-ecting the general diagnosis of constitutional syphilis, whether sulting from inoculation or from hereditary transmission. The pos-bility of the existence of a syphilitic taint should always be borne mind, and in any doubtful case it is requisite to make rigid vestigation in order to clear up this point. If direct information annot be obtained, it may often be procured indirectly by enquir-g about the ordinary secondary and tertiary symptoms of syphilis, ch as sore-throat, rash, &c. Examination of the throat, mouth, ngue, and eyes, as well as over the tibiæ or skull, may give evi-nce of past or present disease, in the form of cicatrices, iritic hesions, nodes, and other lesions. The existence of paralysis of single nerve, especially one of the cranial nerves, is strongly indicative of acquired syphilis. Nocturnal pain is also a suspicious sign. In not a few cases the effects of treatment afford ample proof of the presence of the disease.

Inherited syphilis may in many instances be recognized at an advanced period by pallor, and an unhealthy aspect of the face; arrest of growth or development; a sunken bridge of the nose; the peculiar teeth, or the early loss of the temporary set; pits and scars or even actual ulcers on the skin, about the angles of the mouth, or in other parts; keratitis or its remains; double deafness without otorrhœa; amaurosis; periosteal nodes or their remains; or a very prominent forehead, resulting from meningitis.

TREATMENT.—For *constitutional syphilis* the two great remedies are *mercury* and *iodide of potassium*, the former being especially valuable during the secondary stage, the latter during the tertiary. *Mercury* may be introduced into the system by the mouth, by inunction, or by the mercurial bath, and it is in many cases requisite to bring the patient rapidly under its influence, of course due care being taken to prevent any injurious effects. *Calomel*, *blue-pill*, and *bichloride* or *iodide of mercury* are the forms in which it is usually administered, and both the *bichloride* and *iodide* are often very beneficially combined with *iodide of potassium* in the later stages. Local applications of *mercurial ointment* or *black-wash* are valuable in many cases.

Iodide of potassium should be given at first in doses of gr. v three times a day, and then gradually increased to gr. x, xv, xx, or even xxx in some instances. When this drug cannot be borne in such large quantities, it has been found that great benefit may be derived from its administration in very small doses. It is often usefully combined with *decoction of cinchona* and *ammonia*.

Congenital syphilis decidedly requires *mercury*. It may be given in the form of *hydrargyrum c. cræta*, gr. ½ twice or thrice a day; or the *ointment* may be rubbed into the arm-pits and inner surface of the thighs; or the milk may be used to convey it, *blue-pill* being administered to the mother or nurse, or the milk of a mercurialized goat being employed. At the same time all *hygienic conditions* must be carefully attended to, and the child properly fed. Cleanliness is essential, and simple local applications are often necessary, or *black-wash* may be needed. Toilet powder should be freely used over the seat of any eruption. The use of *cod-liver oil*, either internally or by inunction, is frequently attended with much benefit.

In the advanced stage of congenital syphilis *mercury* often disagrees seriously, and at the early stage it sometimes cannot be borne. *Iodide of potassium* must then be substituted.

CHAPTER XXXIV.

TUBERCULOSIS—SCROFULOSIS.

MANY questions bearing upon *tuberculosis* and *tubercle* remain still very unsettled, and all that can be aimed at in this work is to give a brief general summary of the present state of knowledge and opinion on the subject.

Many believe in the identity of the *scrofulous* and *tubercular* diseases; others consider them as entirely distinct.

ÆTIOLOGY.—Looking upon tuberculosis as a *constitutional* disease, it has almost universally been regarded as having a *hereditary* origin. Undoubtedly various forms of tubercular disease run in families, but many pathologists are of opinion that only a constitutional debility is transmitted, with a tendency to inflammations of a low type, the products of which rapidly become caseous, and may thus lead to tubercle. This is the view strongly maintained by Niemeyer, and he believed that the same result would follow in the case of children born of parents debilitated from any cause. Occasionally tubercle is actually congenital, being observed at birth. Intermarriages, very early marriages, and advanced age of the father have been set down as causes of inherited tuberculosis. It is highly probable that syphilis in the parent has considerable influence in its development.

Age materially affects both the development of tubercle, and its seat. It is by far most frequently met with in children and young persons. The majority of deaths from tubercular affections occur between 20 and 30 years of age. In children the disease tends to involve a number of organs; in adults it is more localized. The glandular system is very frequently implicated in the former.

A number of causes which tend to *lower the state of the general health*, have an important influence in predisposing to tuberculosis, or to the local development of tubercle. Among these may be especially enumerated imperfect ventilation, want of fresh air, and close confinement; over-crowding; want of exercise; constant residence in a humid atmosphere; unhealthy, insufficient, or indigestible food, including the milk of the mother or nurse; intemperance; interference with the free expansion of the chest, due to clothing or occupation; previous diseases, such as measles, hooping-cough, and various fevers, as well as many chronic affections; long-continued dyspepsia; prolonged lactation; excessive sexual indulgence; undue mental labour, and depressing passions. Many of these are frequently found acting in concert, especially among the poor and hard-worked inhabitants of large towns. Unfavourable hygienic conditions, combined with improper diet, are particularly liable to affect children injuriously.

It is believed by some that tuberculosis may be conveyed by infection from one individual to another, through the medium of the breath and exhalations, but there is no adequate foundation for such a notion. Nor is there any reason to suppose that the disease is transmitted by vaccination.

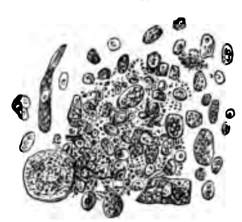
The immediate causation of the formation of tubercle will be discussed under the head of PATHOLOGY.

ANATOMICAL CHARACTERS.—*General description.* The typical variety of true tubercle almost universally recognized at the present day consists of certain minute bodies, termed *grey granulations* or *miliary tubercles.* These appear as small nodules or granulations, about the size of a mustard or millet seed; generally of a roundish form, but sometimes slightly angular; well-defined; firm; of a greyish-white or pearly-grey colour; more or less translucent; and non-vascular. These may be quite separate and distinct; or collected into irregular groups, their individual outline being then rendered indistinct. In some structures, however, tubercle is more diffused, and appears as a greyish *infiltration,* which presents a smooth and dense section; but many so-called tubercular infiltrations are probably inflammatory in their origin. In its earlier stage tubercle is not visible to the naked eye, and it is by continued growth and agglomeration of fresh tubercles that it becomes perceptible, appearing either as granulations or infiltrations according to their mode of arrangement.

What has been described as *yellow tubercle* is nothing but nodules or masses of caseous matter, derived either from tubercle, or from various inflammatory and other morbid materials which have undergone cheesy degeneration. True tubercle may be mixed with this material; while it also tends to excite inflammation around, and thus its physical characters may be more or less modified.

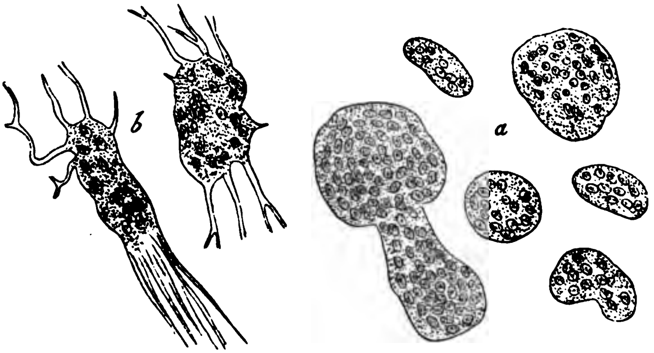
Microscopic structure.—Tubercle may be described as consisting of the following histological elements:—1. *Lymphoid corpuscles,* which are very small, round, colourless, translucent, and slightly granular, each containing a single nucleus. 2. *Epithelioid cells,* of larger size, very delicate, and hence liable to rupture and to set their nuclei free. 3. A *giant-cell,* which consists of a mass of finely-granular protoplasm of very varied form, often presenting processes at its margin, and having imbedded in it a great number of nuclei, chiefly at its periphery, and sometimes regularly arranged. 4. *Free nuclei.* 5. An *intercellular substance,* which may be either amorphous, homogeneous, and hyaline; or granular; or in the form of a fine reticulum or net-work of delicate fibres. There is much difference of opinion among observers as to the presence, arrangement, and relative proportions of these elements; and it must be borne in mind that they vary according to the seat of the tubercle. The lymphoid cells are generally considered to be most abundant, but Schüppel describes tubercle as being made up chiefly of epithelioid elements surrounding the giant-cell. The giant-cell has attracted much attention of late years. It occupies

FIG. 10.



Elements from grey tubercle; miliary granulation. Jones and Sieveking).

FIG. 11.



Giant-cells. *a*. Rounded (*Virchow*); *b*. With processes; from a muscular tumour (*Billroth*).

the centre of each tubercle, and great importance was attached to it by Schüppel and others, but it has since been shewn that this element is found in many healthy and morbid products, as well as in tubercle. Tubercle has been distinguished by some writers as *cellular* and *fibrous*, according to the proportion of cells and fibrous reticulum entering into its formation. Friedlander, however, insists that in recent tubercle no fibres are visible, and that the appearance is due to the hardening processes employed in its preparation for microscopic examination. Tubercle does not contain any vessels or lymphatics of its own, but it may involve those belonging to the original tissue in which it is formed; and it may also enclose pigmentary matters. As tubercle undergoes degenerative changes, its microscopic appearances necessarily alter materially.

Changes and terminations.—Some very important changes are liable to take place in connection with tubercle. 1. *Absorption.*—It is probable that tubercle may be absorbed after it has undergone degenerative changes. 2. *Caseous degeneration.*—The want of vascularity, and consequent low vitality of tubercle, renders it very liable to this change. The process begins in the centre of the granulations, causing them to become yellow and opaque. Ultimately the material often becomes so softened as to be converted into a purulent or curdy-looking fluid, simulating an abscess; or a firm cheesy mass is produced, which may become encapsuled. As the cheesy degeneration proceeds, the microscopic appearances change, the cells shrivelling and breaking up, while granules, oil-particles, and cholesterin appear in abundance, finally nothing but a granular debris remaining. 3. *Calcification.*—This frequently follows caseation, the substance consequently becoming inert. Sometimes the calcareous matter is subsequently discharged, or becomes surrounded with a fibrous capsule. 4. *Elimination and its results.*—After the process of softening has been completed, the material is often eliminated, thus giving rise to ulcers on mucous membranes, or to cavities in organs, as is well exemplified in the case of the intestines and lungs. These ulcers and cavities may ultimately heal up, and a permanent cure may result, the cicatricial tissue formed being very prone to contract. More commonly however, the destructive process extends, owing to the formation of fresh tubercles on the walls of the ulcer or cavity. Occasionally a cavity results from the death and discharge of a quantity of tubercle *en masse*. 5. *Fibroid change.*—There is sometimes an increase of the fibrillated stroma, perhaps more frequently than is generally believed, coincident with a disappearance of the cells, and finally a tuberculous granulation may consist almost entirely of fibrous tissue, becoming dense and hard. This is probably identical with the change which has been described as *cornification* or *obsolescence*, in which tubercle becomes opaque, horny, and bluish-grey.

Tissues and organs affected.—Lymphadenoid tissues are specially prone to tubercle, but it may involve any of the connective-tissues. Several organs or structures may be affected at the same time, but in adults tubercle is often confined to one organ. In most cases of *acute tuberculosis*, grey granulations are seen throughout almost every organ in the body. Parts actively growing are most liable to be implicated. The most frequent seats of tubercle are the lungs and respiratory passages; the bronchial, mesenteric, and other absorbent glands; the small intestines; the pleura, peritoneum, and pericardium; the pia mater; and the spleen. It is not uncommonly met with in the kidneys and genito-urinary passages; in the testes; or in the brain and spinal cord. In other parts it is rare. Tubercle has been described in connection with morbid products, such as scrofulous ulcers, chancres, and cancerous growths. Louis laid it down as a law, that if tubercle is found after 15 years of age in any part of the body, it is certain to be present in the lungs.

Pathology.—Until within a comparatively recent period tubercle was almost universally regarded as a *specific exudation from the blood*, at first fluid, but soon coagulating into a molecular blastema, the molecules aggregating together to form cells. This view is not yet extinct, though the researches of late years have satisfactorily proved that it is quite incorrect. Observers, however, are by no means agreed as to the *nature* and *origin* of tubercle. Some still consider that many of its cells at any rate come directly from the blood, being of the nature of leucocytes; others regard these cells as being the result of retrograde metamorphosis of pre-existing tissue-elements or morbid products. Virchow and his followers believe that tubercle arises from proliferation of the fixed corpuscles of the connective-tissues. On account of its structure, which resembles that of *lymphatic* tissue, tubercle is regarded by many pathologists as being of this nature, and as merely resulting from a *hyperplasia or excessive growth of pre-existing adenoid or lymphatic tissue*. This is the view strongly maintained by Burdon-Sanderson, and it is one which has found much favour. It is supported by the fact that adenoid tissue is usually very extensively distributed, having been discovered in the peri-vascular sheaths of the small arteries in various structures; beneath the epithelium of serous membranes; around the minute bronchia; under the mucous membrane of the alimentary canal; in the spleen and other glands; beneath the conjunctiva; and in other parts. In the peri-vascular sheaths of the arteries tubercle is described as being very commonly observed, the cells increasing at separate points, so as to compress or even ultimately to close the vessels.

More recent investigators have described tubercle as originating in the *lymphatic vessels* themselves, by a metamorphosis of their endothelium and outer tissues; around the lymphatics, as the result of a *peri-lymphangitis;* or in connection with the *small blood-vessels.* Rindfleisch believes that the lymphoid cells are derived from the endothelium of blood-vessels and lymphatics; the epithelium of serous membranes, of the lungs, and of the kidneys; and the muscular tissue of the bronchia. Others deny that tubercle can arise from epithelium or muscular elements. The formation of the *giant-cell* has received much attention. Schüppel described it as originating in changes in a small blood-vessel. It has also been attributed to alterations affecting the endothelium of the vessels; and to aggregation of leucocytes. Klein, whose researches into the nature of tubercle are highly important, affirms that in the lungs he has followed the development of giant-cells from the epithelial-cells of the alveoli with all possible certainty.

Another pathological question relating to the formation of tubercle has reference to its *mode of origin* or *direct causation.* The chief views held on this point may be stated as follows:—

1. That tubercle is merely the local development of a peculiar *constitutional diathesis,* either hereditary or acquired, which is recognized as *tuberculosis.*

2. That it may originate from some direct *local irritation* under certain circumstances, especially in structures where lymphatic tissues exist, quite apart from any constitutional condition, the tubercle being simply the result of a local inflammation.

3. That it is the product of an *infective* process, being the secondary result of the absorption of cheesy morbid products into the blood, which somehow act as a poison, and give rise to a specific inflammation originating tubercle. This view was first advanced by Buhl, and experiments performed upon living animals by Villemin, Lebert, Wilson Fox, Waldenburgh, Clark, Burdon-Sanderson, Cohnheim, Feltz, Chauveau, and others, have shown that bodies resembling miliary tubercles can be artificially produced in the lungs, glands, and other organs of animals, especially the guinea-pig. This has been effected by the inoculation of tuberculous matter under the skin, as well as of various other cheesy morbid products; by the insertion of putrid meat; by putting a seton in the skin, or even causing a simple wound; by injecting cheesy matter into the serous cavities, bronchia, blood-vessels, or heart; and even by feeding animals on caseous tubercle. These artificial tubercles are associated with very numerous inflammatory growths, which rapidly become caseous. These experiments give weight to the infective theory, though some observers deny that the morbid appearances thus produced have any analogy with tubercle.

Acute general tuberculosis not unfrequently follows some local lesion, especially where caseous matter is formed. The same statement is often true with regard to localized *tubercle*, as in certain instances when it is developed in the lungs or lymphatic glands. Niemeyer was of opinion that caseous matter generates tubercle by a *local*, rather than by a *general* infection. The primary channels by which the infecting materials are generally supposed to be conveyed are the lymphatics, by means of which these materials may be carried into the blood, being then distributed throughout the body.

SYMPTOMS.—Much difference of opinion has always prevailed as to whether there is a true *tubercular diathesis*, indicated by any characteristic signs. Many persons unquestionably become tuberculous who present no obvious peculiarities, but the following characters are looked upon as evidencing a tendency towards the disease in children and young persons. They are tall, slim, erect, and delicate-looking, having scarcely any fat; while they present usually a pretty oval face, a clear complexion, bright eyes, and large pupils. The skin is very thin, soft, and delicate, and through it bluish veins are visible; the hair is fine and silky, often light, the eye-lashes being long. Tubercular subjects cut their teeth early, and are generally precocious and clever, walking and talking soon. They are excitable and active in body and mind. The ends of the bones are very small and firm, their shafts also being thin and rigid; while the cartilages seem to be very soft and flexible. The thorax is small, being either long and narrow, or flattened anteriorly.

The *scrofulous* or *strumous diathesis* is characterized as follows:—The body is short, thick-set, and heavy; the face plain, tumid-looking, with expanded and thick alæ nasi, a low forehead, a large upper lip, and a dull pasty complexion. The skin is thick and opaque, and is very subject to obstinate eruptions of a moist character, with a great tendency to the formation of scabs. Chronic abscesses or exudations are also liable to form in the subcutaneous tissues. Scrofulous children often exhibit the phlegmatic temperament, being inactive and languid in mind and body, as well as backward in intellect, this being evident in their expression. The bones are thick, with rather large ends, being very liable to caries or necrosis. Chronic disease of the joints is also common. The teeth often decay early. Derangements of the alimentary canal are of frequent occurrence, and the belly is generally tumid. The lymphatic glands usually exhibit marked changes. They become enlarged chronically, the enlargement being attributed to chronic inflammation, hyperplasia of the normal lymphatic tissues, or to the actual development of tubercle; and this is very apt to end in caseous degeneration, or in slow and unhealthy suppuration. Unhealthy inflammation of mucous membranes is very frequently observed, the products being rich in cells and of a sticky character, while the membrane itself is the seat of an exudation containing abundant cells; the inflammation often ends in ulceration. Ophthalmia, tinea tarsi, ozœna, otitis with otorrhœa, throat-catarrh, and catarrh or more serious inflammation of the alimentary or respiratory mucous tracts, are of common occurrence. Scrofulous luals are very liable to the development of tubercle. They may : subjects of pyelitis, cystitis, or of catarrh of the vagina or

local development of tubercle as a *chronic* disease is attended orresponding local symptoms; and also with indications of or less general disturbance as a rule, in the way of fever, ation, debility, anæmia, night-sweats, and other symptoms. will be more particularly considered when treating of the lual diseases of organs.

TE TUBERCULOSIS. It is necessary briefly to allude to the oms which are associated with the deposit of tubercle as an ffection. Generally almost all the organs in the body are ed under these circumstances, but only the lungs and brain y reveal any local signs, and even these are often very ob-

ee forms of acute tuberculosis have been described, namely, *idious*, *acute febrile*, and *adynamic*, but all grades are met with, the *duration* and *course* of the disease are very variable. At ere may be merely languor, heaviness, irritability, or restless- derangement of the digestive organs, with offensive stools; lar fever, the temperature being sometimes very high; and wasting. Or repeated rigors occur, followed by high fever, in extremely rapid pulse; much constitutional disturbance rostration; and profuse sweating. Head symptoms are ; and there is a great tendency towards typhoid symptoms, s a dry brown tongue, sordes, and a feeble pulse. Breathing hurried, and there may be some cough, but no marked *l signs* can be detected in the lungs, there being usually some ionchal sounds. Ultimately evidences of the presence of le in certain structures often appear, in the form of tuber- neningitis, peritonitis, or other lesions.

NOSIS.—It is always important to recognize any tendency to ular disease when it exists, especially in young persons, is indicated by the family history, and by what the examina- the patient reveals. It must be remarked, however, that ons commonly regarded as tubercular are frequently ob- in individuals who present none of the characteristic features diathesis. The diagnosis of the local formation of tubercle pon the presence of local clinical signs; accompanied with ial constitutional symptoms.

e tuberculosis is by no means easy to diagnose with certainty y cases; the condition may closely resemble certain fevers, ally typhoid fever. It should always be remembered in obscure occurring amongst children. The absence of the peculiar oms of the exanthemata, or of any eruption; the range of tem- re; extreme frequency of the pulse; very quick breathing; y and rapid course of the illness; and the local symptoms supervene, will usually enable the diagnosis to be made.

GNOSIS. The existence of well-marked signs of the tubercu- r strumous diathesis is a matter of serious moment, and any n which such signs are present requires to be carefully watched. The prognosis of cases in which the local development of tubercle has taken place will depend upon the seat and extent of the mischief, and various other circumstances. *Acute tuberculosis* is an extremely grave condition, the termination being almost invariably fatal.

Treatment.—When there is any tubercular or strumous tendency, all *hygienic* conditions, as well as the *diet*, should be rigidly attended to. Fresh air and sunlight; proper exercise; warm clothing; change to the sea side, with salt-water baths; nutritious diet carefully regulated, with plenty of good milk; and the avoidance of undue mental labour, are chiefly indicated. The *digestive organs* must be kept in order, and all sources of irritation in connection with these organs should be at once removed. Every cause likely to originate lung-affections must be carefully avoided, and it will be well to examine the chest from time to time, as well as to treat the slightest pulmonary complaint without any delay. *Cod-liver oil; iron* in various forms, especially *steel-wine*; and *tonics*, properly administered, do a great deal of good in these cases. The treatment of local formations of tubercle will be considered in their respective chapters. In *acute tuberculosis* no measures are of much avail, but the administration of *quinine* in full doses, and the application of cold externally, and of ice to the head, might be tried; along with supporting diet and stimulants.

Chapter XXXV.

CARCINOMA—CANCER—MALIGNANT DISEASE.

Cancer is a constitutional affection, attended with the formation of new growths of a malignant nature. Though mainly a surgical disease, yet it not uncommonly comes under the observation of the physician, and therefore a brief general consideration of the subject is called for in this work.

Ætiology.—Cancer is decidedly a *hereditary* disease. *Age* exercises a marked influence as regards its occurrence, nature, and seat. It is rare in the young, being by far most common after middle life, and the mortality from this disease increases as age advances. In early life the softer varieties of cancer are met with; and the lymphatic glands are very liable to be involved. Primary cancer is chiefly observed in organs which have been in a condition of high functional activity, but whose functions have ceased to be performed. *Females* suffer most, on account of the frequency with which the uterus and mammæ are attacked. The digestive organs, bones, and skin are most affected in males. Anxiety, mental distress, and a depressing climate seem to have some influence as *predisposing causes* of cancer.

Injury, excessive use of a part, or some other form of irritation may act as the *exciting cause* of the local development of a malignant growth. Some pathologists consider cancer as essentially local in its origin.

ANATOMICAL CHARACTERS.—Different classifications have been made of the varieties of cancer, but all forms of the disease may be brought under one of the following:—1. *Scirrhus.* 2. *Encephaloid.* 3. *Colloid.* 4. *Epithelioma.* Each of these requires separate consideration.

1. *Scirrhus, fibrous,* or *hard cancer.* This variety either infiltrates tissues, or forms distinct tumours, which are irregular in shape, but never of very large size. The growth is often depressed, and causes puckering of overlying structures. The consistence is very hard and firm, sometimes approaching that of cartilage. A section is grey, blueish-white, or whitish, and glistening, while opaque fibrous bands may be seen intersecting the surface. This form of carcinoma presents but very slight vascularity. The outer part of the growth is less dense than its central portion, and yields a milky juice on scraping.

2. *Encephaloid, medullary,* or *soft cancer.* Assuming the form of tumours, or being infiltrated, encephaloid increases with great rapidity, forming considerable masses, which are more or less lobulated. The substance is soft and brain-like, and on section presents a pulpy appearance, especially towards the centre of a growth, varying in colour from white to crimson according to its degree of vascularity, and not uncommonly presenting small extravasations of blood. A large quantity of juice can be expressed. This form of cancer may produce very vascular fungous growths, being then termed *fungus hæmatodes.* All grades are met with between the encephaloid and scirrhus forms of carcinoma.

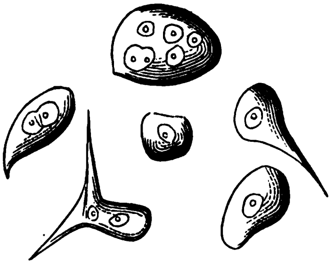
3. *Colloid, alveolar,* or *gelatiniform cancer.* Many regard this variety of malignant growth as merely one of the other forms which has undergone colloid degeneration. It generally infiltrates tissues, but sometimes forms lobulated masses, which have a tolerably firm and uniform consistence. On section roundish spaces or alveoli are seen, having fibrous walls enclosing the colloid substance, which is of more or less glue-like consistence, glistening and translucent in appearance, and either colourless or greyish-yellow.

4. *Epithelioma, epithelial cancer,* or *cancroid.* Generally observed in connection with the skin or a mucous membrane, epithelioma commences either as a hard nodule, or as a small excoriation or ulcer. The latter has indurated edges, with an irregular, grey or bloody surface, which is often papillated and villous, or nodulated. The consistence is generally firm, but may be soft and friable. The cut surface is greyish-white, or presents numerous opaque specks and white lines of fibrous tissue; a small quantity of milky granular fluid can be expressed, which will not mix with water.

Other varieties of cancer which have been described are named *melanotic,* which contains much pigment, the growth being most commonly of an encephaloid character; *cystic,* where cysts are developed; *chondroid* or *cartilaginous; osteoid* or *bony;* and *villous,* which affects mucous surfaces, presenting villous processes.

General and microscopic structure. All the forms of cancer consist of *cells*, enclosed in the meshes of a *fibrous stroma*, these elements differing greatly in their relative proportions in the different varieties. The *cells* are of large but very variable size; present diverse and curious forms; and contain one or more nuclei, as well as usually a number of fat molecules. Each nucleus is large, clear, and well-defined; eccentric; round or oval in shape; and it encloses one or more nucleoli. Abundant free nuclei are often present. The expressed juice contains a quantity of these cells, as well as nuclei, and free granules. The *stroma* is generally firm and fibrous, the fibres being either delicate or coarse; but if it has developed rapidly, it presents an embryonic structure. The vessels are solely distributed in this stroma, and its fibrous bundles intersect in all directions, forming a communicating network, within the alveoli of which the cells are grouped. Lymphatics have been found accompanying the blood-vessels, and they communicate with the alveoli.

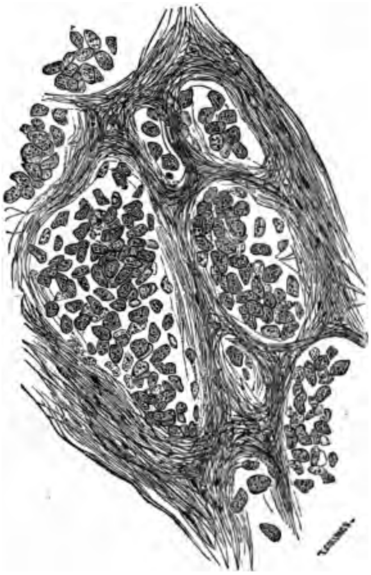
FIG. 12.



Cells from a mammary cancer, magnified 300 diameters. (After *Billroth*).

In *scirrhus* the cells, though they may be abundant at first, speedily disappear, and the fibrous stroma is greatly in excess, especially

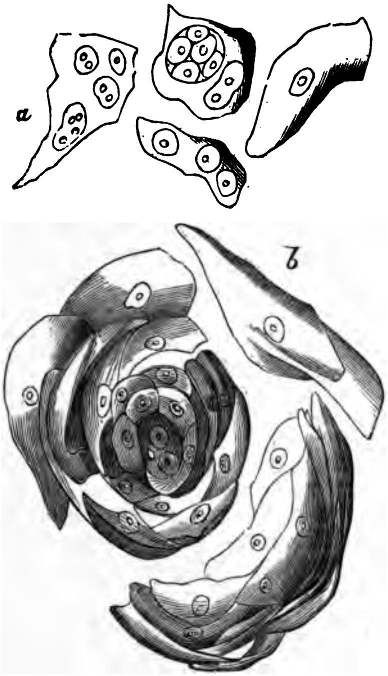
FIG. 13.



Primary Cancer of Rectum. (*Creighton.*)

towards the centre of the growth, where finally no cells at all can be discovered. In *encephaloid*, on the other hand, the cells are greatly in excess, developing rapidly and as speedily degenerating, becoming granular, and their nuclei being set free. There is but little stroma, which is soft, delicate, and very vascular. *Colloid* is in great part structureless, but some cells are present, which are large and spherical, often having a lamellar outline, and containing some of the colloid material. *Epithelioma* presents generally a large number of cells, which, with few exceptions, are exceedingly like those of squamous epithelium, but are subject to great alterations in shape from mutual pressure. They tend to form peculiar *concentric globes* or *nests*, or *epithelial pearls*, which increase from within, so that the outer layers become hardened and flattened. Ultimately the entire groups of cells may become dry, firm, and brownish-yellow. A variable amount of stroma is present.

FIG. 14.



Epithelial Carcinoma. *a.* Separate cells; *b.* Epithelial pearls. (After *Billroth*).

Cancerous growths are very liable to *fatty degeneration*, especially the softer forms, and as a result the cells become more granular, and softening takes place; or parts of the growth may assume a caseous appearance. *Calcification* is very uncommon. *Melanosis* and *colloid* are generally regarded as forms of cancer which have undergone these peculiar degenerative processes. All cancerous growths tend to ulcerate, the ulcers having no disposition to heal, but being on the other hand inclined to spread.

Organs and tissues affected. *Scirrhus* is usually observed in the mammary gland, uterus, stomach, rectum, or skin. *Encephaloid* affects chiefly the bones, testicles, eyes, and internal organs, especially the lungs, liver, kidneys, brain, and spleen. *Colloid* particularly involves the stomach, but is sometimes seen in the omentum, intestines, and other parts. *Epithelioma* grows in connection either with the skin or a mucous surface, but by extension it may invade upon any tissue. Its ordinary sites are the lower lip, the tongue, eyelids, cheeks, scrotum, prepuce, labia, uterus, or bladder. In exceptional cases internal organs are involved.

Several parts may be attacked, either simultaneously, or usually in succession. In the latter case the original formation is said to be *primary*, and subsequent growths are named *secondary*. Secondary deposits are frequently observed in internal organs, being generally of the same variety as the primary growth, but scirrhus is often followed by encephaloid in internal organs. Malignant formations usually show a marked tendency to spread, and to infiltrate surrounding tissues, so that no line of demarcation can be observed; in rare instances a kind of capsule forms around a growth.

PATHOLOGY.—Two very opposite views are entertained as to the *nature* and *origin* of cancer, viz :—1. That it is primarily a *constitutional* or *blood-disease* or *cachexia*, of which the formation of malignant growths is but a local manifestation. 2. That it is in the first place a *local affection*, produced by some direct irritation; and that the blood is only changed secondarily, as the result of absorption of morbid materials from the local formation. It is not at all improbable that both these theories are correct in different cases. *Secondary* growths arise in consequence of absorption by the blood-vessels and lymphatics, by which the cancerous material is conveyed to distant parts, especially those more immediately associated with the structure first affected. Neighbouring absorbent glands are very liable to become involved.

The stroma of cancer consists partly of the original cellular tissue, but is chiefly derived from hyperplasia of the connective-tissue elements. The cells originate in the proliferation of pre-existing cells; some pathologists think they are only derived from epithelial structures, but others believe that they are also developed from connective-tissue corpuscles, leucocytes, and other cells.

Dr. Creighton, in his investigations respecting malignant tumours, has arrived at the following conclusions:—In *secondary* tumours the parenchymatous cells, and not the cells of the connective-tissue of an organ, are the elements that undergo transformation. This transformation consists in a vacuolation of the protoplasm of the cells, with other associated changes; the products remaining as tumour-cells, or as indifferent cells which may further develope into connective tissue. Vacuolation has been otherwise described as endogenous cell-formation, a mode of cell-growth that is essentially heteroplastic, the products being alien to the original tissue. Both in physiology and pathology it is a familiar process, as, for example, in the development of colostrum-cells, spermatozoa, mucous and salivary corpuscles, and the goblet-cells so abundantly found amongst the epithelium of mucous surfaces; and Dr. Creighton concludes that the process of secretion in the epithelial cells of mucous surfaces is essentially a process of endogenous cell-formation. This being the case, a true physiological basis has been established for the theory of the formation of secondary malignant tumours. The theory may be extended to the origin of *primary* malignant tumours in epithelial parts, for it is evident that if the epithelium, in the exercise of its functions, endogenously produces solid elements instead of fluid substance, the result will be a heteroplastic growth. The growth of the malignant tumours in the mammæ, for example, may be explained in this way.

Primary and *secondary* malignant tumours have a distinct genetic relation to each other. The primary precedes the secondary in point of time; a remarkable family-likeness can in most instances be traced between them; and, what is of the greatest significance, the process of vacuolation or endogenous cell-growth, by which the secondary tumour is developed, bears a remarkable resemblance to the first changes in the ovum after impregnation. To explain the origin of secondary tumours in a healthy organ, the influence of the primary or parent tumour must manifestly be assumed, an extraneous influence operating by the mechanism of endogenous cell-formation. This influence, Dr. Creighton contends, is comparable to a spermatic influence, which is exercised in some unknown manner by the parent tumour. Dr. Creighton attempted to produce cancer artificially, but without success.

SYMPTOMS.—Cancer usually gives rise to two classes of symptoms, viz., *general* and *local*. The *general* symptoms may precede the local, and include more or less wasting; a peculiar sallow, cachectic look, with a yellowish, earthy tint of countenance; a careworn, gloomy expression; debility and languor; anæmia and its accompaniments; and irregular fever. These vary much in their intensity according to the part affected; as well as with the rapidity of growth, and nature of the cancer, being most marked in connection with the scirrhus variety. The *local* symptoms may be summed up as pain and tenderness or other subjective sensations, often very severe, the pain being frequently of a lancinating or burning character; symptoms resulting from interference with the functions of the part affected, these being in many cases of serious moment; those due to pressure upon, or irritation of, neighbouring structures; and objective or *physical signs* afforded by the growth itself. The *duration* of cases of malignant disease is very variable, but it is rarely prolonged, and sometimes they run an acute course.

Chapter XXXVI.

I. DIABETES MELLITUS—GLYCOSURIA.

Ætiology and Pathology.—It is now certain that a trace of sugar always exists in the blood, being used up in the process of nutrition, and especially in nourishing the muscles. Further, it has been proved that a certain amount may be destroyed in the system without being excreted by the urine, but this amount is limited.

A small quantity of sugar is often temporarily present in the urine under certain circumstances, especially after taking food containing much sugar or starch; after the administration of chloroform; in poisoning by strychnine or woorara; in various conditions which interfere with respiration, such as fits of asthma or hooping-cough; in certain nervous diseases, for example, epilepsy, tetanus, or apoplexy; and in connection with injuries affecting the nervous system, the liver, and other parts. Glycosuria can also be induced experimentally in several ways. In the disease now under consideration, however, the urine permanently contains sugar, generally in large proportion, and in most cases this is accompanied with serious constitutional disorder.

Many views have been advanced to explain the *pathology* of diabetes, but in the present state of knowledge it must be provisionally classed as a *general* or *constitutional* disease. There is every reason to believe that its phenomena are due to some derangement of the so-called *glycogenic* functions of the liver, though what the exact deviation is, and how it is brought about, are by no means settled questions. It seems quite certain that in health an amyloid, fermentable substance, capable of conversion into grape-sugar, and named *glycogen*, or *animal* or *hepatic dextrine* or *starch*, is formed in the liver from sugar received from the intestines. It is also proved that a peculiar ferment exists in the blood, capable of converting this glycogen into sugar. Bernard and his followers believe that in the normal state this conversion is constantly taking place in the liver, the sugar being conveyed into the circulation by the hepatic vein, and being gradually oxidized and destroyed in the system. Pavy and those who agree with him deny that there is any such change in health, and maintain that when sugar is found in the liver after death, it is formed *post-mortem*. Dr. M'Donnell has advanced the theory that the hepatic dextrine is not converted into sugar at all, but unites with nitrogen to form a new protein-compound resembling casein. Those who hold the first view maintain that diabetes consists either in an *increased formation* of sugar in the liver, or in a *diminished destruction* of that normally produced; hence it accumulates in the blood, and is excreted by the kidneys. The second class of pathologists are of opinion that under certain conditions the ferment reacts upon the glycogen in the liver, and that this leads to an *unnatural production* of sugar. In some cases undoubtedly excessive consumption of starchy and saccharine articles of food is the cause of glycosuria, the liver being unable to convert the whole of the sugar into glycogen. It is believed by some authorities also that the muscles both form glycogen, and convert it into sugar, and that these structures may have some influence in the causation of diabetes.

The probability is that the disorder of the hepatic glycogenic function, whatever it may be, can be brought about in several ways. Experiment, as well as clinical and *post-mortem* examination, has proved that in many cases it depends upon a morbid condition of certain portions of the *nervous system*. By irritating or injuring the portion of the sympathetic which sends branches to the liver, as well as certain parts of the spinal cord, or the floor of the fourth ventricle, glycosuria may be induced. It is believed that this nervous disturbance acts through the vessels of the liver, inducing paralysis of their circular muscular fibres, with consequent passive dilatation and congestion, so that the ferment and amyloid matter come into close contact; or that the nerves directly affect the amount of glycogen formed, and the rapidity of its conversion into sugar. Pavy has found that injection of arterial blood into the portal vein will induce marked glycosuria, and he believes that this explains its occurrence in connection with experimental nervous lesions, which induce vaso-motor paralysis of the vessels of the chylo-poietic viscera, so that the blood will reach the liver without being de-arterialized in its natural way.

The *exciting causes* of diabetes are in many instances by no means evident. Among those to which the disease has been mainly attributed are exposure to wet and cold; drinking cold water when the body is heated; abuse of alcohol, sugar, and starchy substances; strong emotional disturbance, or excessive mental work; injuries to the head, spine, and various other parts, or general concussion of the body; and organic diseases of the brain or spinal cord. In some cases the disease seems to have followed the prolonged action of depressing mental causes, combined with influences which tend to impair the health, as, for instance, grief and anxiety with long-continued watching over the sick; or worry and close confinement in business. Occasionally it has appeared to be the sequela of some acute febrile disease.

As regards *predisposing causes*, diabetes is most common in adults, from 25 to 65 years of age, especially during the period of development and activity of the sexual functions; in males, after the period of puberty; and in persons residing in cities and manufacturing districts. In some instances there appears to be some hereditary influence; or the disease tends to run in families.

ANATOMICAL CHARACTERS.—There are no morbid appearances at present recognized as peculiar to diabetes, but the most important lesions which have been observed are those associated with the *nervous system*. In some cases there is obvious organic disease, such as a tumour affecting the medulla or pons, or pressing upon the sympathetic. In others minute microscopic examination is necessary in order to detect the pathological changes. Dr. Dickinson has described peculiar alterations in various parts of the nerve-centres, especially about the medulla and pons, in the way of dilatation of the arteries, followed by degeneration and destruction of the nerve-elements around these vessels, leading to the formation of excavations, which may be of some size. Other observers have, however, failed to detect any such changes on the most careful examination in cases of diabetes of the most typical character. Most authorities deny that there is any special morbid condition of the *liver*, though some observers have described peculiar changes in its general or microscopic characters. The *kidneys* are often diseased, but this is a secondary result of the diabetes, the most frequent morbid state being some form of Bright's disease. The *lungs* are also frequently affected, there being usually a form of phthisis, occasionally pneumonia of a low type, or gangrene. The *heart* is generally small, and wanting in tone. There is a tendency to *serous inflammations* of a low type; and to inflammation of other structures ending in suppuration or gangrene. *Hypertrophy of the pancreas* is said to be comparatively frequent in cases of diabetes. The *stomach* is generally dilated, its mucous coat being thickened and softened, and its muscular coat sometimes hypertrophied.

Symptoms.—Clinically cases of diabetes differ remarkably in their severity, one class presenting but slight symptoms; another group being accompanied with marked local and constitutional disturbance. In a typical example of the disease the symptoms may be arranged under the following heads:—

1. *Urinary organs* and *urine*.—Micturition becomes more and more frequent, and the urine is increased in quantity. This fluid is also irritating in quality, and hence often causes in the male a sense of heat or burning along the urethra, or sets up slight inflammation, excoriation, or even ulceration about the orifice; while in the female the vulva is frequently much irritated, and may be the seat of troublesome itching. This may lead the patient to indulge in masturbation. Pain and tenderness are often felt over the region of the kidneys. The quantity of urine may amount to 8, 12, 20, or even 30 pints in the 24 hours. It is usually very pale, clear and watery, the more so in proportion to its quantity; possesses a sweet taste, and occasionally a sweetish odour; has a high specific gravity this being generally about 1040, but it may range from 1015 to 1060 or more; ferments rapidly if kept in a warm place, with the formation of torulæ, at the same time becoming opalescent, or depositing a sediment; while it yields more or less sugar to the usual tests. (See Examination of Urine, Vol. ii. page 239-241). Many different statements have been made as to the proportion of urea and uric acid present; probably these constituents are as a rule absolutely increased, but relatively to the water they are diminished. The quantity of water is about equal to that taken into the system. The amount of sugar is greater after food has been taken, especially after such articles as contain much sugar or starch, being considerably less when the diet is restricted to animal food. In any pyrexial condition it becomes greatly diminished, or may even disappear altogether, no glycogen being formed in the liver under these circumstances. The proportion of sugar usually present ranges from 8 to 12 per cent., and from 15 to 25 ounces are

discharged daily on the average; but the quantity may vary from less than an ounce to two pounds or more. The urine may contain albumen, or occasionally a little blood; it is also stated to yield fat sometimes, or to resemble chylous urine in its characters.

2. *Digestive organs.*—A very constant symptom of diabetes is insatiable thirst, attended with a dry, parched, and clammy condition of the mouth and throat, due to the presence of sugar in the blood, which creates a demand for much liquid. In many cases also there is excessive appetite, but disinclination for food is not uncommonly observed. The tongue generally presents a peculiar irritable, red, clean, cracked, and dry appearance; it may, however, be moist and furred. Sponginess of the gums, with a tendency to bleeding, and rapid destruction of the teeth, are frequently noticed. The saliva contains sugar, and is said to be very acid sometimes, owing to the conversion of this sugar into lactic acid. The breath has in some cases a distinctly sweet or ale-like odour. Dyspeptic symptoms are of common occurrence, such as epigastric fulness or sense of sinking, flatulence, gaseous and acid eructations. As a rule the bowels are constipated, with pale, dry, and spongy stools; but there may be diarrhœa or dysenteric symptoms, especially towards the close of a case.

3. *General symptoms.*—The aspect of the patient is in many instances strikingly characteristic of diabetes, the prominent features being emaciation, often extreme, involving not only the fat but also the muscles, which feel flabby and soft; a peculiar dry, harsh, scurfy condition of the skin; and a distressed, worn, and suffering expression of countenance. The patient feels very weak and languid, is often chilly, and is indisposed for any bodily or mental effort, at the same time complaining of pain and soreness in the limbs. Slight œdema of the legs is frequently observed, and occasionally dropsy affects other parts. Sometimes the temperature is markedly reduced, and in any pyrexial condition it does not become nearly so much elevated as it otherwise would be. Sexual inclination and power are commonly greatly diminished or lost. The mental condition and disposition become usually much altered in established cases of diabetes, as evidenced by decline of mental vigour; disposition to lassitude or drowsiness; lowness of spirits; petulance and irritability; or decline in firmness of character and moral tone. Temporary dimness of vision is not an infrequent phenomenon. The blood contains sugar, which is also found in the various secretions.

4. *Complications.*—Most of the complications of diabetes have been already alluded to in the account of its morbid anatomy, the most frequent symptoms coming under this head being those indicative of phthisis. Here may also be mentioned the not uncommon occurrence of boils and carbuncles; chronic skin-affections, such as psoriasis; gradual permanent blindness, from atrophy of the retina; and cataract, the last being almost always of the soft kind, and attributed to imbibition of sugar, which, it is said, has been detected in the lens.

Course and Terminations. The precise clinical history of diabetes varies much in different cases, as regards the intensity and exact combination of the symptoms just described, and the rapidity of the progress of the disease. Ordinarily the course is essentially chronic, the symptoms setting in very insidiously, and becoming gradually but progressively worse. It may happen that for a considerable time the advent of diabetes is only indicated by slight general symptoms, such as debility, languor, and some loss of flesh. Occasionally the disease runs an acute course; or it may exhibit remissions from time to time, and may certainly be often materially influenced by treatment, in some cases a cure being effected. It is frequently observed that the symptoms are more intense at the early stage than subsequently. Most cases ultimately prove fatal, and towards the close the symptoms often change considerably in their characters, the urine and sugar diminishing in quantity; albuminuria setting in; there being complete disgust for food; and hectic or colliquative diarrhœa occurring. The fatal result usually arises from gradual exhaustion; from blood-poisoning, leading to stupor ending in complete coma, or occasionally to convulsions; or from complications. Now and then death takes place quite suddenly.

Diagnosis.—When diabetes is well-established, there ought to be no difficulty in detecting the disease. The urinary symptoms and characters of the urine; the symptoms referable to the alimentary canal; and the general condition are highly characteristic. The rule of always examining the urine carefully when the health is persistently out of order, and especially if there are the slightest symptoms suggestive of this complaint, will often lead to a diagnosis at an early period. If a patient complains of languor and debility, or is losing flesh without any obvious cause; if much irritation is experienced about the external genital organs; or if a child is detected masturbating, diabetes should always be borne in mind. The mere finding of a trace of sugar in the urine is not, however, evidence of the presence of diabetes. It must be in some quantity, persistent, and attended with polyuria. Seldom is there any possibility of finding out definitely the exact morbid condition upon which the diabetes depends.

Prognosis.—Confirmed diabetes is a very serious disease, a large proportion of the cases ending fatally, and their average duration is stated to be about from one to three years. In many instances, however, much improvement may be effected; and in some instances recovery can be brought about. The chief circumstances which influence the prognosis are age, it being worse in very young than in old persons; the general condition of the patient, the disease being much less serious in stout individuals; the cause of the complaint; the amount of sugar and urine passed; the severity of the general symptoms; the presence or absence of complications, as well as their nature; the duration and progress of the case; the results of treatment, and whether this is properly carried out. Any person suffering from diabetes should be particularly cautioned against exposure and other recognized causes of disease.

TREATMENT.—Cases of diabetes must necessarily call for much diversity in their management, but there are certain general principles to be followed, to which attention will now be directed. At the outset it is most important to impress upon patients that they must be prepared to place themselves under strict discipline and guidance, and that much of the success of treatment will depend upon their own conduct.

1. The first indication almost universally recognized in the treatment of diabetes is *regulation of the diet.* The object aimed at is to prohibit, or to restrict within proper limits, the consumption of such articles as contain sugar or starch, especially ordinary bread or flour; sugar in any form; honey; vegetables and fruits containing starch or sugar, namely, potatoes, peas, beans, carrots, turnips, parsnips, strawberries, raspberries, plums, gooseberries, currants, apples, pears, &c.; rice; prepared varieties of starch, as arrowroot, sago, macaroni, tapioca, and vermicelli; shell-fish, and the soft parts of crabs and lobsters. Animal food, including meat, poultry, game, and fish, should be the main diet, with the exception of liver. Dr. Lauder Brunton has suggested the use of raw meat, finely chopped, and mixed with pepper and salt. The chief substitutes for bread which are employed include bran-cake or biscuits, gluten bread, almond rusks and biscuits, or very thin slices of bread toasted until they are almost black. Eggs, butter, cheese, broths, good soups, and jellies are admissible; also vegetables not containing sugar or starch, such as cabbage, Brussels sprouts, broccoli, cauliflower, lettuce, cress, mustard, and celery.

The question of *drink* is one of much moment. *Milk* is theoretically contra-indicated in diabetes, because it contains much sugar, but it has been found in some instances that when given in moderate quantities milk is not injurious, and may even prove highly beneficial. Therefore it is allowable to try the effects of a regulated amount of this article of diet in any individual case, being guided accordingly. The milk may be mixed with *lime-water* or *soda-water.* Cream may be given in abundance if it agrees. Dr. Donkin has advocated the treatment of diabetes entirely by skimmed milk, given in quantities of from 6 to 8 or even 12 pints daily, and continued for several weeks if necessary, no other food or medicine being allowed. My experience of this treatment is anything but favourable, but I have found much benefit result from giving a considerable quantity of skimmed milk daily, as much as 3 or 4 pints, along with other food. Dr. Lauder Brunton has recommended the use of butter-milk. The balance of evidence is decidedly against the consumption of *alcoholic stimulants* to any considerable extent. A small quantity is frequently serviceable, those forms of stimulant being employed which are most free from sugar, viz., dry sherry, bitter ale, brandy or whiskey, well-diluted claret, and Burgundy. Tea and coffee without sugar may be allowed; and also cocoa made from the nibs, provided it agrees. It is not desirable to restrict the quantity of liquid too much, but it must be moderated so far as the feelings of the patient will permit. Most injurious is it to knock off liquids suddenly, and I have known a rapidly fatal issue result from this cause. Thirst may be relieved by iced water; by acid drinks, of which a solution of *phosphoric acid* has been much recommended; or by a solution of *cream of tartar*. Prout affirmed that tepid liquids give more relief than cold. The Bristol Hotwells, Carlsbad, and Vichy waters are said to have some direct influence upon diabetes, in addition to being serviceable as a drink, whilst the Carlsbad waters have also an aperient action.

It is highly important to attend to certain matters in regulating the diet. 1. The change should be brought about gradually and not suddenly. 2. Frequent variations in the food should be made amongst those articles which are permissible. 3. In many cases it is necessary to watch carefully that the regimen laid down is strictly adhered to, especially at the early period of treatment, and among ignorant patients. 4. Every individual case must be studied for itself, and the advisability of persevering in the restricted diet or not judged by the results. In some instances, where there is much loathing of the food, a little bread is often of great service. Again, if a fair trial of the recognized diet does not seem to lead to any improvement, or if the general condition is getting worse, as may especially happen when the disease is far advanced, it may be desirable to let the patient follow his own inclination, guided by intelligence and common sense; sometimes also patients cannot possibly take the prescribed food, and then a mixed diet must be permitted.

Allusion may be here made to the *saccharine* treatment of diabetes, in which sugar and honey are administered in considerable quantities, any diet being allowed. This has been proved to be decidedly injurious in the majority of cases.

2. General *hygienic management* is highly important. The patient should be completely clad in flannel; and should have two or three warm baths every week, or an occasional Turkish bath. Change of air, especially to the sea-side, with sea-bathing, is useful in some cases. Regular and sustained active exercise in moderation is often of great service.

3. Numerous *medicines* have been brought forward, which are supposed to have a direct curative influence upon diabetes, especially in limiting the amount of urine and sugar discharged. The principal of these include *opium*, given in gradually increasing doses up to gr. vi—xx daily, which certainly seems to be useful in some cases; *codeia*, in doses of from gr. ½ to gr. iij; *morphia; alkaline bicarbonates; pepsine; rennet; arsenic* in the form of *Fowler's solution; iodine* or *iodide of potassium; bromide of potassium; conia; cannabis indica; lactic acid* or *lactate of soda; glycerine; quinine; ergot; ether; valerian; permanganate of potash;* and *peroxide of hydrogen.* These are supposed to act either upon the nervous system; or by promoting the decomposition and combustion of sugar; or by supplying a readily-combustible substance in its place. The evidence in favour of the efficacy of most of these drugs, however, is by no means satisfactory.

4. *Symptomatic* treatment often calls for attention in diabetes, this being especially directed to the digestive organs; to the general

condition and state of the blood; to nervous disturbance, in the way of sleeplessness and restlessness; and to the various complications. These must be managed on ordinary principles. *Iron*, especially in the form of *tincture*, as well as other *tonics*, are often of much service. *Cod-liver oil* is also valuable in many cases. It must be borne in mind that complications may considerably modify the treatment of cases of diabetes.

II. DIABETES INSIPIDUS.

This affection is characterized by great thirst; with an increased flow of urine, which is watery and of low specific gravity, but does not contain any sugar or other abnormal ingredient. The proportion of solids discharged in the twenty-four hours may be normal, excessive, or below par. Frequent micturition is often observed. Occasionally the patient enjoys excellent health, but more commonly there are more or less of the symptoms which are noticed in diabetes mellitus, especially a dry and harsh skin, loss of flesh and weakness, and dryness of the mouth. In most cases the appetite is not excessive, but sometimes it is voracious. As a rule the complaint is chronic in its onset and course; occasionally it sets in suddenly. Recovery is extremely exceptional, but death usually results from some organic complication.

ÆTIOLOGY. The ætiology of diabetes insipidus is very obscure. The probable immediate cause consists in dilatation of the renal vessels due to paralysis of their muscular coat, resulting from deranged innervation. The condition can be induced experimentally by irritating a certain spot in the floor of the fourth ventricle. It has also been attributed to injury of the nervous centres or sympathetic trunk; organic diseases of the brain and cord; depressing emotions; hysteria, neuralgia, and other nervous disorders. Among other alleged causes should be mentioned exposure to cold; drinking cold water when the body is heated; violent effort; and previous febrile or inflammatory attacks.

TREATMENT. *Opium*, *valerian*, *camphor*, *nitrate of potash*, *iron*, and *iodide of potassium* are the chief remedies recommended in the treatment of diabetes insipidus. Withdrawal of liquids from the diet has not proved successful. The use of the constant galvanic current, applied over the hypochondrium, has been advocated.

II. LOCAL DISEASES.

In treating of *local diseases*, the plan is adopted of giving a summary of the general clinical characters which belong to each organ or system, and of the methods to be employed in their clinical investigation, before entering upon the consideration of the individual disorders to which they are liable. It may be stated once for all, however, that it is always of essential importance to study the *constitutional condition* of the patient, as this materially affects the diagnosis, prognosis, and treatment of local affections. Some of the more important symptoms will be discussed as fully as the limits of this work will permit.

Chapter I.

DISEASES OF THE MOUTH, TONGUE, AND SALIVARY GLANDS.

Clinical Characters.—Important indications are often afforded by the mouth and tongue with regard to the state of the system generally, and of the alimentary canal, but these parts may also be the seat of local affections, to which attention will now be directed. Their presence may be revealed by the following symptoms and signs:—

1. *Altered sensations*, such as pain, soreness, or a feeling of heat or dryness; as well as various derangements of the sense of *taste*. 2. More or less *interference with the actions carried on in the mouth*, viz., mastication, sucking, the first stage of deglutition, and articulation. These acts are also often attended with pain. 3. *Changes in the quantity or quality of the saliva;* or the escape of *unusual discharges*, such as pus, blood, &c. 4. A *disagreeable odour of the breath*, which may amount to extreme fœtor. 5. *Interference with the act of breathing* occasionally, owing to mechanical obstruction to the passage of air. 6. A change in colour, or the existence of any swelling, deposit, ulceration, or other morbid condition, as disclosed on *objective examination* of the mouth, aided by a good light. At the same time the glands in the neighbourhood should be examined.

I. Inflammation of the Mouth.—Stomatitis.

Stomatitis is a very common affection, and occurs under several forms. Its varieties are:—1. *Catarrhal.* 2. *Follicular.* 3. *Aphthous.* 4. *Ulcerative.* 5. *Parasitic.* 6. *Gangrenous.* 7. *Mercurial.*

Ætiology.—The chief *predisposing causes* of stomatitis are:—1. Age, the different forms being far most common in infants and young children. 2. Improper hygienic conditions, such as want of cleanliness, impure air, or unhealthy residence. 3. Errors in diet, or ı insufficient supply of food. 4. Certain unhealthy conditions of e system; or the presence of certain diseases. The different rms of stomatitis are exceedingly rife among the children of the ɔor, especially those living in large towns. This applies particu-rly to the more severe varieties of the disease, the *gangrenous* rm being rarely met with except among this class of patients. ıfants are very commonly affected who are brought up by hand, fed on artificial food; or who have suckled for too long a time, or ave been nursed by an unhealthy mother. Children who are debi-tated from any cause, and those prematurely born, are also very ·one to this class of diseases. They are common in cases of con-enital syphilis; and also as complications or sequelæ of one of ıe exanthemata. *Thrush* is frequently associated with typhoid ver; or, in adults, with chronic wasting diseases, especially ıthisis. *Gangrenous* stomatitis rarely occurs except after some acute ness, particularly severe measles.

Exciting causes:—1. *Local irritation* is one of the most frequent ıuses of stomatitis. This may arise from want of cleanliness, ntition, decayed teeth, suckling imperfectly-formed or inflamed pples, or for too long a time; as well as from all forms of me-ıanical or chemical irritation, undue heat or cold, excessive smok-g, wounds, ulcers, and other local morbid conditions. 2. The ilder varieties may be dependent upon *disorder of the alimentary nal*. Repeated *follicular* stomatitis in adults generally indicates ıme gastric derangement. 3. The presence of some *poison in the ɔod* frequently excites inflammation in the mouth. This partly :plains its occurrence in the acute specific fevers. *Metallic* poisons, ɔwever, are those which ordinarily act in this way, especially ercury. 4. Catarrh of the mouth may be due to *extension of in-ımmation* from neighbouring parts. Hence it may be associated ith erysipelas of the face; or with throat-affections. 5. *Contagion* iginates some forms of stomatitis. *Thrush* can be propagated by rect transplantation of the fungus which excites it, though it does ɔt usually spread in this way, being probably due to the presence the spores in the air, which in the mouth find favourable condi-ɔns for their development in the decomposing food and epithelium, eir growth being aided by the parts being kept at rest, and by ant of cleanliness. Some authorities believe that *ulcerative* stoma-:is is contagious.

SYMPTOMS.—The clinical history of each variety of stomatitis will eed a brief description.

1. SIMPLE OR CATARRHAL.—When acute, this form of stomatitis egins as small bright-red patches on the inside of the cheeks, or t the angles of the mouth. Ultimately, by extension and coales-ence of the patches, the whole mucous lining may be covered. here is more or less swelling of the affected parts. At first the urface is dry, but soon excessive secretion forms, containing many nperfect cells. Superficial erosions or ulcerations are often pro-ıced. The *subjective sensations* are pain or soreness, heat, a slimy eling in the mouth, and impaired or unpleasant taste. The eath is often disagreeable. Generally the *alimentary canal* is out

of order, as evidenced by a furred tongue, loss of appetite, and, in children, by disordered bowels and flatulence. Children are also irritable and sleepless. Catarrh of the mouth often occurs as a chronic affection.

2. Follicular or Papillary.—At first little red raised spots are seen, which feel hard; these are due to enlarged and obstructed mucous follicles. As a rule they soften and burst, discharging their contents, and leaving small, circular, well-defined ulcers, with some surrounding redness. A good deal of soreness is complained of.

3. Aphthous or Croupous.—Much confusion has existed with regard to what is meant by *aphthæ*, but it seems best to restrict the term to certain small ulcerations, which have a special mode of origin. They commence as little whitish or whitish-yellow spots on the lips, cheek, palate, or tongue, which are often in considerable number, and may become confluent. More or less redness surrounds each spot. They are generally considered to be vesicular, and to contain a fluid, which gradually becomes opaque, while the vesicles ultimately rupture. Some authorities, however, regard them as solid exudations under the epithelium, of a croupous nature, which become detached from the circumference towards the centre, leaving superficial ulcerations. Aphthous stomatitis is usually attended with much pain, rendering sucking, mastication, deglutition, or even speaking difficult to perform. The buccal secretion is increased, and there may be much salivation. The breath has often a very disagreeable smell. Infants are usually feverish and restless, even for some days before the aphthæ appear. They refuse nourishment, but are thirsty. The tongue is furred, and diarrhœa or vomiting may be present.

4. Ulcerative or Diphtheritic—Gyngivitis Ulcerosa.—This is a form of inflammation which usually ends in extensive and unhealthy ulceration, and it may assume an epidemic character. It is regarded by some as of a diphtheritic nature. As a rule it begins on the margin of the lower gums in front, but may extend backwards, or to the lips, cheeks, or tongue. The gums appear much congested, swollen, and spongy; bleed very readily; and seem to be separated from the teeth. Soon a deposit is observed, in the form of membranous-looking patches, at first whitish, but speedily becoming grey or even black. Tolerably firm and adherent at the outset, and leaving a bleeding surface when detached, the substance shortly becomes soft and pulpy. It has been stated that the mucous membrane itself is involved, a diphtheritic slough being formed. The patches usually separate, leaving irregular ulcers, which may spread and run together so as to give rise to an extensive ulcerated line or surface. The margins of the ulcers are raised, the surrounding membrane being congested, swollen, and œdematous. They are usually not deep, and their surface is covered with a pulpy yellowish substance. If properly treated, they generally heal quickly, but in some cases serious results follow, the teeth dropping out, and the jaws becoming carious or necrosed.

The *subjective symptoms* are generally severe. There is a great deal of pain, increased by movement of the jaws or other local irritation; hence there is much difficulty in chewing or swallowing. The saliva is very abundant, and is frequently mixed with blood and other matters. The breath is very fœtid. Often the glands in the neighbourhood are enlarged and tender. In most cases the constitutional symptoms are but slight.

5. Parasitic or Fungous—Thrush—White Mouth.—By these and other names a variety of stomatitis is described, which depends upon the presence of a parasitic fungus, *oidium albicans*. At first red patches form, on which whitish points appear, which may extend and coalesce into considerable patches of variable thickness. They look like curdled milk, being of a soft consistence, and they are soon easily detached. The material consists of epithelium and fat, in which are imbedded the sporules and filaments of the fungus. The deposit first appears generally about the angles of the mouth, but may be noticed on any part of this cavity, and it even extends occasionally to the pharynx, larynx, œsophagus, or, very rarely, to the stomach. There is necessarily a good deal of pain and soreness about the mouth, which is hot and dry, the saliva being diminished in quantity at first.

Very young infants are subject to thrush as a distinct affection, which is ushered in by some slight fever, and attended with digestive disorders, evidenced by vomiting; diarrhœa; pain, tenderness, and swelling of the abdomen; and irritation about the anus. In most cases, however, this complaint is associated with some pre-existing disease, especially with certain acute specific fevers, and chronic exhausting diseases, such as phthisis. Under these circumstances there may be no particular symptoms. In connection with the acute specific fevers thrush does not add to the danger; but in chronic affections it is commonly a sign of approaching death.

6. Gangrenous—Cancrum Oris—Noma—Water Canker.—This is a very rare, but exceedingly dangerous form of stomatitis. It begins insidiously, and almost invariably first affects one of the cheeks, attacking its inner surface. When the patient comes under observation, the cheek usually presents a circumscribed hard swelling, with surrounding œdema. The skin covering it is tense, shining, and hot; generally red, the colour shading off from the centre, which is bright; but sometimes the surface is pale or mottled. The mucous membrane is merely reddened at the outset, but soon becomes discoloured and gangrenous, and a vesicle often rises upon it. Then a small irregular ulcer forms, with jagged and red or livid edges, and a sloughy surface. After a time the central spot of bright redness on the skin becomes livid, and finally black, being converted into a dry slough, which extends rapidly. At the same time the gangrene spreads internally, so that finally the entire cheek may become affected, or even one-half of the face or more, while the gums, lips, and tongue are also frequently involved to a variable extent. When the sloughs separate, the mouth is opened up, the teeth often drop out, and the bones may be exposed and

necrosed. A hideous excavation with ragged gangrenous edges is left, which may still go on spreading. If the destructive process is checked, the surface may clean, granulate, and cicatrize, but great deformity often results, with adhesion of various structures.

The gangrene does not necessarily spread to the extent just described. It may only produce a hole in the cheek, which ultimately closes up or remains as a fistulous opening. The glands and tissues around are always infiltrated, swollen, and hard.

One of the most striking features of this disease consists in the fact that pain and tenderness may be either very slight, or altogether absent. A large quantity of saliva flows from the mouth, which is extremely fœtid, and mixed with blood and gangrenous discharges. Serious hæmorrhage does not occur, because the vessels are blocked up by coagula. The breath has an excessively foul, gangrenous odour.

The *general* symptoms vary considerably, but it is often observed that even when the disease is extensive they are by no means severe. Much will depend upon the previous condition of the patient. There is not much fever as a rule, the skin being cool; and the strength may be fairly maintained for a while, at the same time food being taken eagerly. The pulse at first is rather frequent. As the disease progresses, there is a tendency to prostration, the patient ultimately becoming extremely low and asthenic, with a very feeble and small pulse. Food may be taken to the last, and there is much thirst. Diarrhœa often sets in. The patient frequently becomes delirious or drowsy in fatal cases. Death may result from septicæmia or asthenia.

7. MERCURIAL.—The first effect of mercury is to cause redness and tumefaction of the gums, which feel tender and bleed readily; while the patient experiences a peculiar metallic taste; the saliva is increased; and the breath has a characteristic unpleasant odour. Afterwards superficial greyish sloughs and ulcerations form along the margins of the teeth, and the gums become detached, the teeth loosening or even falling out. There may be extensive inflammation of the mouth and tongue, ending in ulceration, suppuration, or actual gangrene. Salivation becomes very profuse, various discharges being mixed with the saliva. The salivary and lymphatic glands and other neighbouring structures are swollen and painful; while much pain is experienced in the mouth and face, with difficulty in moving the jaws, in swallowing, and in speaking. Only slight constitutional symptoms are usually observed.

DIAGNOSIS.—The different forms of stomatitis are readily recognized when the mouth is properly examined. In infants it is highly important to bear these complaints in mind, and to look to the mouth should these subjects appear to be ailing. It must also be mentioned that the *ulcerative* and *gangrenous* varieties sometimes set in and extend very insidiously, giving rise to little or no disturbance. Fœtor of the breath may lead to their discovery.

PROGNOSIS.—Most cases of stomatitis can be readily cured, if appropriate treatment is carried out. The *ulcerative* and *gangrenous* forms of the disease may prove serious. In chronic wasting diseases, especially phthisis, the occurrence of *thrush* may indicate a speedily fatal termination.

Treatment.—The indications for the treatment of the various forms of stomatitis may be summed up as follows:—

1. *Hygienic conditions* must be properly observed, and duly regulated in every respect. 2. Particular attention is required with regard to *diet*, especially in the case of infants. If they are suckling, care must be taken that they are not fed too frequently or excessively; and that the nipple is properly cleansed, and in other respects satisfactory. At the same time the mother's health must be looked to, and she must be prevented from using irritating articles of food. If an infant is brought up by hand, good milk should be given, while the feeding-bottle must be kept scrupulously clean, and used only at regular intervals. Inquiry should also be made as to any artificial diet employed, as this is often of a very irritating nature. 3. The state of the *alimentary canal* frequently needs correction. Aperients are called for in many cases, such as *castor oil*, a dose of *jalap* with *calomel*, or *rhubarb* with *magnesia*. Antacids are also valuable, especially *lime-water* with milk, *carbonate of soda* or *magnesia*, or *chalk*. 4. A most important indication is to remove or avoid all sources of *local irritation*, such as dentition, bad teeth, and excessive smoking. In the case of infants the mouth must be properly cleansed. In the treatment of *mercurial* stomatitis, of course the withdrawal of the drug is essential. 5. *Local applications* are often of great value.—In *simple* stomatitis nothing is required, unless there should be much mucus on the surface, when it is desirable to wash the mouth out with a weak solution of *carbonate of soda* or *chlorate of potash*. In the *aphthous*, *follicular*, and *ulcerative* forms, a solution of *chlorate of potash* is very valuable, either employed as a mouth-wash, or directly applied with a camel's hair brush. If there is much irritation demulcent washes afford relief, such as thin *mucilage*. A weak solution of *Condy's fluid* is serviceable for the purpose of checking fœtor. Subsequently astringent applications are often called for, especially *alum* in the form of solution or powder. The direct application of *nitrate of silver* to ulcers may be requisite, either in the solid form or as a solution. In the treatment of *thrush* various local remedies are useful, viz., a solution of *sulphite of soda* (ʒ i ad ℥ i); *borax* and *honey*; *vinegar* and water; *creosote*; *bromide of sodium* with *glycerine* and water; or solution of *chlorate of potash*. *Cancrum oris* calls for energetic local treatment. The gangrenous surface must be at once freely and effectually destroyed by strong *nitric* or *hydrochloric acid*, the former being preferable, and it may be necessary to repeat the application. Antiseptic mouth-washes should be freely used, such as one containing *Condy's fluid*, *chlorine*, or *carbolic acid*, which may also be employed as dressings: *Chlorate of potash* solution is likewise very valuable in this form of disease. Poultices externally are also required, these being changed frequently, and sprinkled with some antiseptic. 6. *General treatment* is called for in some instances.—In the majority of cases of ordinary stomatitis no general treatment is required, but if the health is lowered from any cause, it is important to use measures

for its improvement. When there is extensive *ulceration*, tonics and *tincture of steel*, along with nutritious diet, are often of essential service; and the internal administration of *chlorate of potash* also leads to most satisfactory results. In *gangrenous* stomatitis one of the most necessary parts of the treatment consists in keeping up the patient's strength in every possible way, by means of nourishing soups, wine or brandy, *ammonia* and *decoction of bark*, *mineral acids*, or *quinine* with *tincture of iron*. *Chlorate of potash* solution should be employed as a drink at the same time. The internal administration of antiseptics is recommended in this form of the disease.

II. GLOSSITIS.—PARENCHYMATOUS INFLAMMATION OF THE TONGUE.

A. ACUTE GLOSSITIS.—This is an inflammation of the actual substance of the tongue, leading to an exudation in the midst of its muscular fibres, and in exceptional instances involving the latter also. It is a rare, but very acute and dangerous affection.

ÆTIOLOGY.—1. Some *direct irritation* is almost always the cause of glossitis, which may result from mechanical injury; swallowing boiling liquids; the action of acrid or corrosive substances; or a sting of the tongue by some insect, especially the bee and wasp. 2. It is very rarely due to some *poison* in the system either mineral (mercury), animal, or vegetable. 3. Occasionally glossitis occurs as a *complication* or *sequela* of one of the exanthemata. 4. In extremely rare cases it originates from *extension of inflammation* from neighbouring parts, such as the tonsil.

SYMPTOMS.—The entire tongue is usually implicated, and presents the following characters:—The organ is enlarged, so that the mouth cannot contain it, and it may project some distance beyond the teeth even, being indented at the sides, and the pressure exerted upon it may lead to its ulceration. The surface is dark-red, generally smooth, shining, and tense, but it may be fissured. The dorsum is covered with fur, which tends to be brownish. Owing to its protrusion and exposure, the tongue soon becomes dry. If resolution does not speedily take place, small abscesses may form, which coalesce and finally burst if they are not opened. Rarely gangrene occurs. The tongue may remain large for a considerable time. This condition is attended with marked pain and tenderness, a feeling of heat, and other uncomfortable sensations. All the functions of the tongue are necessarily greatly interfered with. Occasionally, by causing mechanical obstruction, or by pressing upon or originating œdema of the larynx, the enlarged organ seriously impedes respiration, and may even threaten asphyxia. There is much salivation; while the breath is very disagreeable. The glands and tissues around are usually inflamed, and the face may appear tumid and congested, in consequence of pressure upon the jugular veins.

The *general* symptoms are usually severe, there being much inflammatory fever, with marked restlessness. Nutrition becomes greatly impaired, and signs of imperfect aëration of the blood may supervene.

Diagnosis.—The appearances presented by the tongue, as described above; and the accompanying local symptoms, are sufficiently characteristic of glossitis.

Prognosis.—Glossitis is at all times a serious affection, but especially when it results from severe local irritation. It may lead to speedy suffocation. The existence of abscesses increases the gravity of the prognosis.

Treatment.—The first thing to be done in treating glossitis is to neutralize any cause of irritation, if possible, as, for instance, the sting of a wasp, which should be immediately touched with solution of *ammonia*. For severe glossitis, the best treatment seems to be to make free and deep incisions along the upper surface of the tongue. In milder cases the application of a few leeches about the angles of the jaw is recommended. Ice should be constantly given to suck, and the parts must be kept moist. *Saline aperients* may be administered, if required. *Ammonia* and other stimulants are often of great service. When food cannot be swallowed, it may be necessary to administer nutrient enemata at regular intervals. If asphyxia is threatened, it is sometimes requisite to perform laryngotomy or tracheotomy. Incisions must be made as soon as there are signs of abscesses having formed.

B. Chronic Glossitis is occasionally met with, either as a sequel of the acute form, or as the result of some chronic irritation. It may affect the entire tongue, but is usually partial, the organ presenting indurated fibrous patches, especially on its margins. A peculiar form is described under the term *glossitis dissecans*, in which the tongue presents deep furrows upon its surface, which tend to ulcerate.

As regards the *treatment* of chronic glossitis, compression of the tongue, ligature of the lingual arteries, or excision may be necessary.

III. Ulcers of the Mouth and Tongue.

In addition to the forms of ulceration already considered, the following may occur:—1. *Herpetic*, due to an eruption of herpes in the mouth. 2. *Variolous*, resulting from small-pox pustules. 3. *Syphilitic*. These are very frequent on the tongue. 4. *Scorbutic*, chiefly seen about the gums. 5. *Cancerous*. 6. Ulcers due to *local irritation*. These are also common on the tongue, often beginning as small vesicles about the tip and sides. They are generally due to irritation set up by the teeth, and may become very hard, so as to simulate syphilitic ulcers.

Treatment.—This consists:—1. In the removal of all sources of *local irritation*. 2. In attending to the *constitutional condition*. 3. In the use of *local* washes and direct applications, disinfectant, astringent, or demulcent, according to circumstances. The immediate application of *nitrate of silver* is often most useful. *Chlorate of potash* is also very valuable as a local remedy in ulceration of the mouth.

IV. SYMPTOMATIC PAROTITIS—PAROTID BUBO.

ÆTIOLOGY.—The form of parotitis characteristic of *mumps* has already been described, but a brief account is required of a variety of the disease which is liable to attend certain acute affections, either as a *complication* or a *sequela.* It is frequent during severe epidemics of typhus fever, but may be met with also in connection with small-pox, measles, scarlatina, cholera, pneumonia, and other complaints. Sometimes it arises by *direct extension,* as when it follows erysipelas of the face.

ANATOMICAL CHARACTERS.—*Symptomatic* parotitis differs from the *idiopathic* form in its great tendency to end in suppuration, though this is not an invariable result, for resolution may take place. After a period of congestion and tumefaction, a substance collects in the ducts, which soon changes into pus. The lobules break down in the centre, and either form a number of distinct abscesses, or run into one large accumulation of matter, the cellular tissue which separates them being destroyed. The parts around may be extensively involved, cellular tissue, muscles, periosteum, and bones; and the inflammation may even extend to the cerebral meninges or to the brain itself, as well as to the ear. Thrombi may form in neighbouring veins, leading to embolism and septicæmia. Gangrene sometimes occurs.

SYMPTOMS.—These are usually by no means marked at the commencement, and the inflammation often advances very insidiously. When it ends in suppuration, the skin becomes red, and prominent fluctuating points appear. If the pus is not evacuated externally, it may be discharged into the external meatus, pharynx, or mouth; or may find its way to the lower part of the neck, or even into the thorax. The *general* symptoms are usually of a low adynamic type.

TREATMENT.—The *local* treatment should consist of frequent poulticing, and the repeated use of fomentations; as soon as signs of suppuration appear, proper incisions should at once be made. Internally *stimulants* and *tonics* are generally required.

V. CHRONIC ENLARGEMENT OF THE PAROTID.

Occasionally the parotid is chronically enlarged, either as the result of previous inflammation; or from the formation of cancerous or other growths. This may give rise to marked local pressure-symptoms. The enlarged organ usually needs surgical interference.

VI. SALIVATION OR PTYALISM.

Increased flow of saliva is a frequent and troublesome symptom, which may be brought on by a variety of causes. In some cases the secretion is not actually formed in excess, but is allowed to flow from the mouth instead of being swallowed, so that it appears to be in abnormal quantity. The amount discharged varies greatly, but it may be exceedingly large, either continually running from the mouth, or causing the patient to be perpetually spitting or swallowing, or to saturate several handkerchiefs daily. The fluid is not quite identical with healthy saliva, and may be mixed with various morbid materials. It contains some mucus, with numerous epithelium cells. Its reaction is alkaline, and it yields a good proportion of fat, but after a time little or no ptyalin or sulphocyanide of potassium can be detected. Albumen is sometimes present. Digestion is generally impaired; and marked emaciation may be produced. Sometimes the fluid is ejected from the stomach in considerable quantity.

ÆTIOLOGY.—1. More or less salivation accompanies the various sources of *local irritation* in connection with the mouth already considered, such as stomatitis or ulcers; being also produced by irritating substances taken into the mouth. These act by causing reflex excitation. 2. *Reflex irritation* through other nerves often induces ptyalism. Thus it may be associated with throat-inflammations, many diseases of the stomach and pancreas, or worms in the intestines; while it is a symptom very commonly observed in cases of pregnancy. 3. In certain *nervous diseases* salivation is not uncommon, as in various forms of insanity, hydrophobia, hysteria, paralysis, and neuralgia of the face. In some of these affections it is produced in a reflex manner; in others as the result of some direct cerebral influence. 4. Certain *metallic* and *vegetable* substances, when taken for some time, induce ptyalism, by causing local irritation, and also by directly influencing the secretion of saliva. Of these the most important is mercury, but iodine and other substances have sometimes a similar action. 5. *Critical* salivation is observed in some cases of fever, but salivation in febrile diseases is not always connected with a crisis. 6. *Infants* and *old people* are liable to an excessive flow of saliva. In the former this is often associated with *dentition*. In both classes of subjects there is frequently no excess of secretion formed, but the saliva is allowed to escape from the mouth instead of being swallowed. 7. *Idiopathic* salivation is that form which occurs without any obvious cause.

TREATMENT.—1. The *cause* must be sought out, and if possible removed. In many cases this is all that is required. 2. Astringent mouth-washes are useful, such as solution of *alum*, *tannic acid*, *oak-bark*, or weak *mineral acids*; or *alum* may be sucked. 3. *Opium* is recommended as a valuable internal remedy in obstinate cases of ptyalism.

CHAPTER II.

DISEASES OF THE THROAT.

CLINICAL CHARACTERS.—Throat-affections are of very common occurrence, and may be indicated more or less by the following clinical phenomena:—

1. The presence of soreness, pain, or other *morbid sensations*. These vary greatly, both in degree and kind; but among the

most common are a sense of dryness, burning, tightness, or as if a foreign body were present, which induces a constant desire to hawk or swallow. There may also be external tenderness. 2. *Disorders of deglutition.* This act may be painful or difficult, or even quite impossible, and sometimes substances tend to pass in wrong directions, such as into the larynx or posterior nares. The physical conditions of the materials which are being swallowed—such as whether they are solid or liquid, hot or cold,—often influence the degree of dysphagia. 3. *Alteration of the voice,* which is either somewhat hoarse or husky, or even completely altered in its quality, becoming thick and guttural or nasal. The act of speaking may cause pain. 4. *Hawking* and *cough.* These are very common and troublesome symptoms attending throat-affections, especially those of a chronic nature. Even in pulmonary affections, particularly phthisis, the state of the throat often aggravates cough considerably, and the same is true of the so-called *stomach-cough* observed in dyspeptic cases. Frequently the act is attended with the discharge of much mucus. 5. *Disturbance of breathing.* There is not as a rule any difficulty of breathing in mere throat-affections, but in certain cases considerable dyspnœa may be felt, especially on lying down; while patients often breathe with the mouth wide open, and snore loudly. 6. *Foulness of the breath.* 7. *Deafness* occasionally, due to obstruction about the opening of the Eustachian tubes. 8. Signs revealed on *physical examination.* A careful examination of the whole of the fauces is requisite, whenever symptoms point to this part as being the seat of mischief. A good light is needed, and it is sometimes useful to employ artificial light with the aid of the reflector of the laryngoscope. The tongue must be kept down by means of a depressor, or with the finger. In some cases it is also desirable to use the finger for the purpose of feeling the structures in the throat, especially when examining children. By this examination a knowledge is gained:—*a,* of the appearance of the general surface of the fauces as regards colour, degree of moisture, smoothness or roughness, and other characters; *b,* of the presence of any deposit or accumulation of secretion; *c,* of the general form and dimensions of the pharynx and its openings; as well as of the size, shape, and other characters of the soft palate and its arches, the uvula and tonsils; *d,* of the existence of any enlarged follicles, abscesses, ulcers, vesicular or other eruptions, gangrene, old cicatrizations, polypi, or cancerous or other tumours. When the throat is affected, the external structures of the neck should likewise be examined, particularly those about the angles of the jaw special attention being paid to the glands. It will be well also to notice the state of the mouth and lips.

I. Acute Inflammatory Affections of the Throat.

The throat is the seat of acute inflammation of a special character in diphtheria and scarlatina; thrush may also extend from the mouth to this part; or it may be inflamed in connection with eruptions on its mucous surface, especially herpetic and variolous;

or from the extension of erysipelas from the face. At present, however, attention will be confined to *local* inflammatory affections, which are of considerable importance.

ÆTIOLOGY.—*Predisposing causes.*—Throat-inflammations may occur at any age, but are most common on the whole in adults, probably because they are more exposed to the exciting causes. Tonsillitis is chiefly met with among young persons. Former attacks seem to increase the liability to inflammatory throat-affections, many individuals suffering from the slightest cause, or being liable to periodic attacks. Anything that lowers the health is stated to be a predisposing cause of sore-throat, and certainly this is true with regard to living in a hospital for some time. Persons who are constitutionally weak appear to suffer with unusual frequency; and syphilitic individuals are decidedly more liable than others to this class of affection. Intemperance is also said to act as a predisposing cause. Tonsillitis appears sometimes to run in families. Most cases occur during spring and autumn.

Exciting causes.—1. Inflammatory throat-affections generally result from *taking cold* in some way or other, especially from exposure to cold and wet, to sudden changes of temperature, or to damp cold winds. In many cases the complaint seems to be but a part of a general catarrh from this cause. 2. Occasionally the milder forms of sore-throat appear to be due to some *derangement of the alimentary canal;* follicular pharyngitis is often associated with stomach-disorders. 3. *Local irritants* excite more or less inflammation, which may then be of a very serious character, as from swallowing hot water or chemical irritants. 4. Certain forms of throat-inflammation may perhaps be due to some *atmospheric poison* acting on the system. Some cases of hospital sore-throat seem to arise in this way. 5. Pharyngeal catarrh is often a *complication* of the exanthemata. 6. *Excessive use of the voice* is liable to cause sore-throat, especially the follicular variety, which constitutes a part of *clergyman's sore-throat.*

SYMPTOMS.—For clinical description, cases of acute inflammation affecting the different structures of the throat may be conveniently arranged under the following groups.

1. ACUTE PHARYNGEAL CATARRH—CATARRHAL PHARYNGITIS—RELAXED SORE-THROAT—CYNANCHE PHARYNGEA—ANGINA SIMPLEX.—A large proportion of sore-throats may be included in this general group, which are due to *catarrhal inflammation* of the fauces and pharynx, differing much in its extent and severity in different cases. Occasionally the inflammation is of a severe character, and extends more or less deeply. Uneasiness, soreness, or pain is experienced in the throat in proportion to the degree of inflammation, often accompanied with a sense of heat and dryness. Swallowing is always attended with discomfort, and is often painful, though the patient may be constantly inclined to perform the act, being prompted thereto by a feeling as if there were something in the throat, especially when the uvula is involved. There is also a frequent tendency to cough and hawk, in order to remove the secretion formed. The voice is often thick or husky, and the act

of speaking may cause pain; but there is no dyspnœa. The symptoms are generally worse during the night, and after sleep. Occasionally deafness is complained of, the Eustachian tube being blocked up.

Examination reveals more or less general redness of the throat, which is usually bright, but may tend to lividity. The surface appears dry and glistening. Considerable œdema may be observed where the submucous tissue is loose, giving rise to swelling and a watery translucent appearance, particularly in connection with the uvula. Secretion often collects in patches and points over the back of the fauces and on the tonsils; these sometimes look remarkably like diphtheritic patches, but they are easily detached without causing bleeding or excoriation. Not uncommonly superficial erosion is produced, and the more intense forms of inflammation are liable to terminate in ulceration, or in more or less deep suppuration; the latter may constitute a *pharyngeal abscess.*

In slight cases there are no *general* symptoms The more severe forms of pharyngeal inflammation may be ushered in with chiliness, headache, and pains in the limbs; and attended with pyrexia. The pulse may rise to 100 or 120; and the temperature to 102° or even higher. A bright blush occasionally suffuses the face and upper part of the body, where there is no reason to suspect scarlatina. In two cases I have met with albuminuria, which entirely disappeared after a time.

Sore-throat may come on very rapidly, attaining considerable intensity in a few hours, and this particularly applies to a form of *hospital sore-throat* which appears to be of an erysipelatous nature. This generally sets in during the night, and by the morning the symptoms are very prominent. There is much œdema and swelling, but no particular redness; while deglutition is very uncomfortable and difficult.

2. Acute Follicular Pharyngitis.—This variety is characterized by the follicles of the throat being chiefly implicated, which become enlarged, hard, and red. It is attended with a good deal of local soreness or pain, and abundant secretion forms, causing continuous hawking. Sometimes the follicles suppurate and ulcerate.

3. Acute Tonsillitis—Amygdalitis—Cynanche Tonsillaris—Quinsy.—This affection consists in a parenchymatous inflammation of one or both tonsils. Usually some general febrile disturbance is observed before throat-symptoms occur. These are soon manifested, however, and they may appear simultaneously with the fever. At first uneasiness is felt over one or both tonsils, which soon increases to considerable pain, of a dull, aching character, with much tenderness. The throat feels dry, and a most uncomfortable sensation is experienced, as if a foreign body were present. External tenderness is felt behind the angles of the jaw, which may be considerable. Deglutition is difficult and causes much distress, the pain during the act often shooting towards the ear, while in severe cases fluids tend to return through the nose. After a time a quantity of sticky mucus forms, entailing frequent efforts to swallow, or continuous hawking. The voice is characteristically al-

tered, having a thick, muffled, guttural or nasal character, which cannot be mistaken when once heard; occasionally it is altogether lost. Breathing is not interfered with as a rule, but if both tonsils are greatly enlarged, dyspnœa may be felt, especially on lying down. The patient snores loudly during sleep, and the symptoms are always worse on waking. The breath is very unpleasant. Salivation may be present. Deafness and noises in the ears are often complained of.

Examination of the throat is not always easily carried out in tonsillitis, but if it can be effected, the appearances observed are:—general redness of the fauces, but more particularly of one or both tonsils; enlargement of these structures, sometimes so considerable that they meet in the middle line, and almost completely block up the passage, while they look like balls of flesh, and may actually ulcerate from mutual pressure; white or yellowish opaque spots or patches on the surface, being the products of follicular secretion. The palate and uvula are also swollen and œdematous, the latter being almost always observed to adhere to one of the tonsils. When the parts cannot be inspected, the finger must be made use of in order to feel the tonsils, and this is especially required in children, or in the later stages of the complaint to ascertain whether suppuration is taking place. Very often the salivary glands are swollen, and also the structures about the neck, especially the lymphatic glands, which feel firm and tender, a good deal of stiffness and uneasiness being likewise experienced.

Tonsillitis is usually attended with considerable fever, and the patient feels decidedly ill, being often much prostrated. The temperature frequently rises to 102° or more, and may reach 104°; the pulse usually ranging from 100 to 120. There is often severe headache, with much restlessness, and occasionally slight delirium at night. The tongue is covered with a thick creamy fur; appetite is lost, but there is much thirst; and the bowels are constipated. A red rash on the skin is now and then observed. The urine is markedly febrile; while chlorides are deficient, or sometimes almost entirely absent.

Cases of tonsillitis vary greatly in their severity. Frequently only one tonsil is involved, but in many cases both are attacked, generally in succession, but occasionally simultaneously. The inflammation usually attains its height in five or six days, and the entire duration of most cases of tonsillitis is under ten days. Pathologically the disease may terminate in:—*a. Resolution*, the symptoms gradually subsiding. *b. Suppuration*. This is very common, being indicated by the pain becoming more pulsating or throbbing, and shooting towards the ear; by the occurrence of rigors; and by the tonsil feeling soft and fluctuating, or the colour of the pus being actually evident through the redness. The abscess often bursts suddenly, either spontaneously or from some mechanical irritation; or it is opened; and in either case rapid improvement follows the escape of the pus. Only one tonsil suppurates as a rule. *c. Gangrene*, of very rare occurrence, and only met with in those who are low and debilitated. *d. Chronic enlargement*, with a granular or irregular appearance of the tonsil, especially after repeated attacks ending in suppuration, and in weak individuals. Clinically cases of tonsillitis almost invariably terminate in recovery. Death is an exceedingly rare event, but may result from hæmorrhage, or from extension of inflammation to the larynx.

DIAGNOSIS. The fact of the existence of an acute inflammation of the throat is usually readily recognized, and a proper examination will generally reveal its nature. Difficulty may, however, be experienced in determining whether the complaint is *local*, or merely a part of some *general* disease, especially diphtheria or scarlatina. A careful enquiry with regard to the ætiology of the case; the mode of invasion; the collateral symptoms; and the degree of pyrexia, ought generally to clear up any doubt. Sometimes it is requisite to wait for a short time before giving a definite opinion; and it must be remembered that sore-throat may be almost the only symptom of scarlatina.

From *laryngeal* inflammations, those involving the throat are distinguished by the absence or slight degree of dyspnœa as a rule, or its different character when present; by deglutition being more interfered with; by the voice being less altered, or affected in a different way; by cough being a much less marked symptom, and not having laryngeal characters; and, above all, by the results of examination. It must be remembered that the inflammation may spread to the larynx; or the parts may be involved simultaneously, each then giving rise to its own special symptoms.

PROGNOSIS.—Local throat-inflammations are rarely dangerous, but they may become so by occasioning much œdema of the tissues, or by spreading to the larynx, being thus liable to cause suffocation. Death from hæmorrhage has in rare instances occurred in connection with an abscess in the tonsil. It is often difficult to get rid of the liability to attacks of sore-throat.

TREATMENT.—In slight cases of sore-throat the application of a wet rag round the throat at night, covered with a piece of flannel, is all that is necessary. Even when the affection threatens to be severe, it may probably be checked not infrequently by the assiduous application of cold water outside the throat, and the frequent sucking of ice.

In many cases, however, of acute inflammation in connection with the throat, more active treatment is required, and there are certain general rules which should always be carried out. The patient should be kept quiet, in a comfortably warm room, and not allowed to talk. A *saline aperient* may be given at the outset, and the bowels should be kept well-opened. If there is pyrexia, and if the patient is not very weak, it is useful to administer a *saline* mixture for two or three days. It is not desirable to keep the patient low, therefore a good quantity of beef-tea, milk, and other liquid nutritious food should be given in moderate quantities, at frequent and regular intervals. Mucilaginous drinks afford relief; and the frequent sucking of ice is very grateful, as well as beneficial. Stimulants are often indicated, good port-wine being the best form, this being particularly useful during convalescence, and in cases of tonsillitis; in the latter complaint from four to eight ounces of wine may be given during the twenty-four hours.

It is affirmed that by the employment of certain drugs acute inflammatory affections of the throat can be very readily subdued, and their progress stopped. Dr. Ringer and others advocate the use of *tincture of aconite* in small doses frequently repeated. *Guaiacum* has also been supposed to exert a specific influence upon tonsillitis; and an emetic of *ipecacuanha* with *tartar emetic* at the outset has been considered efficacious in checking its course, but this is more than doubtful.

The remedies which I have found of most service in this class of complaints are *quinine* (gr. i—iij); *tincture of iron* (♏xv—xxx); or *dilute nitric acid* with *decoction of bark.* Either of these may be given at intervals of three or four hours, or three times a day, according to the severity of the case, and they are often beneficial from the very commencement. *Quinine* and *iron* may in many cases be advantageously combined. A mixture containing *dilute hydrochloric acid* and *chlorate of potash* has been much commended in acute catarrh of the throat. It is often desirable to order some *saline* drink along with the tonics, such as a solution of *citrate of potash,* so as to maintain a free action on the part of the skin and kidneys. In cases of tonsillitis it is not infrequently requisite to administer some narcotic at night, such as *Dover's powder* or *hydrate of chloral,* but sleep should not be too prolonged. The patient should rest with the head high.

Local treatment is always most important. In the various forms of pharyngeal catarrh steam-inhalations, tepid milk and water gargles, with poultices and fomentations over the front of the neck, give most relief at first. Afterwards astringent gargles are useful, such as one containing *alum, tannin, dilute mineral acids,* or *port-wine.* It may be desirable to apply *nitrate of silver* or its solution, especially in the *follicular* variety. If there is dangerous œdema, it is necessary to scarify the surface; and should suppuration occur, the pus must be let out by incision.

For *hospital sore-throat* the treatment which I have always found rapidly effective is to persevere in steam-inhalation, in frequent gargling, and in the external application of heat and moisture; and to take large quantities of beef-tea, a glass of port-wine every three or four hours, and *quinine* in two or three grain doses every four hours.

For *acute tonsillitis* the best local treatment consists in the continuous application of heat and moisture to the throat, by means of steam-inhalations, and gargles of luke-warm water or milk and water, to which a little *Condy's fluid* may often be added with advantage, in order to diminish the unpleasant taste and odour of the breath. At the same time very hot and well-made linseed-meal poultices should be applied round the front of the neck, being changed at frequent intervals; or spongio-piline wrung out of hot water answers very well. When these applications are removed, the part should be well fomented. These measures tend to subdue the inflammation, if resolution is going to take place; or they will hasten the process of suppuration. When indications appear that pus has formed, it is desirable to let this out and thus give immediate relief; or it may be requisite to puncture the tonsils even though there is no distinct evidence of the presence of pus, especially if the breathing should be greatly impeded. Some practitioners advocate the use of irritating applications to the neck externally, such as sinapisms, liniments, and blisters, but to me these appear decidedly objectionable. Possibly, should there be very severe local symptoms, accompanied with great swelling, it might be advisable to apply two or three leeches behind the angle of the jaw.

During convalescence after tonsillitis tonics are needed for some time, with good nourishing food and a little wine. A change of air often does much good. Locally astringent gargles or other forms of application are necessary, the most serviceable being *glycerine of tannin*, *tincture of steel* with *glycerine*, or *nitrate of silver* solution. Should the tonsils remain permanently much enlarged, it may be requisite to excise them.

As *prophylactic* measures in those who are subject to sore-throat or quinsy, frequent cold douching of the throat externally, and the daily use of cold water or of some mild astringent as a gargle, should be recommended. The general health must be attended to, and all injnrious habits checked. A change of air, and a course of tonic medicines frequently lead to good results.

II. ULCERATIONS OF THE THROAT.

Ulcers are very common in connection with the various structures of the throat, being either *acute* or *chronic*. They may be enumerated as:—1. *Catarrhal*, which are slight and superficial, being very frequently observed, especially at the back of the pharynx, and often associated with chronic catarrh. 2. *Follicular*. These ulcers are generally small, and circular or oval, corresponding to the follicles, but by their union they may become irregular and, of some size. 3. *Syphilitic*, either secondary or tertiary. 4. *Scarlatinal*. 5. *Diphtheritic*. 6. Ulcers following *eruptions*, such as herpes. 7. *Gangrenous* or *sloughing sore-throat—Cynanche* or *Angina maligna*. This form of ulceration is generally associated with syphilis or scarlatina, but may be independent of these affections. Thus it may follow severe catarrhal inflammation, if the patient is in a very low state of health from any cause; and occasionally it occurs as a complication of typhus, enteric fever, or other exanthemata. It spreads more or less extensively, but not as a rule deeply; the mucous membrane is dusky; while there is much œdema around. 8. Ulcers on the *tonsils*, simulating syphilitic ulcers, but probably originating in blocking-up and subsequent inflammation of their follicles. 9. *Cancerous* ulceration, which is extremely rare.

SYMPTOMS.—Ulceration of the throat may be unattended with any symptoms, even when of considerable extent. Usually, however, *local* symptoms are present to a greater or less degree. There may be merely uneasiness or pain and difficulty in swallowing, but when certain parts are destroyed, most unpleasant and dangerous symptoms are liable to arise. Food, especially of a liquid kind, may tend to pass into the posterior nares or down the larynx instead of into the œsophagus. The voice is often completely altered, being thick, guttural, and indistinct; or the patient may scarcely be able to articulate at all. Offensive matters are hawked or coughed up; and the breath is in many cases very foul, sometimes peculiarly so. It is important to notice that dyspnœa is not uncommonly present, being attended with very noisy breathing; and that there may be a liability to sudden death from suffocation, in consequence of the ulceration involving the upper opening of the larynx. In some cases there is also a danger of hæmorrhage.

Ulceration of the throat is often attended with a low condition of the general health, and there may be much emaciation and debility, owing to inability to swallow food. In *gangrenous* ulceration there is a danger of septicæmic symptoms setting in. Of course when the ulceration is part of some special disease, such as scarlatina, the general symptoms will be modified accordingly.

The ultimate local consequences of ulceration are also liable to be very unpleasant, or may even prove dangerous, in the way of permanent destruction of tissues, adhesions, and contractions after cicatrization. I have seen a case in which the throat was one large chasm, with thickened bands extending along its walls, every trace of its various parts having disappeared. Of course under these circumstances swallowing becomes very difficult, and the voice is permanently altered.

DIAGNOSIS.—It must be borne in mind that the throat may be ulcerated without any complaint of local symptoms being made by the patient. The smell of the breath has in not a few instances led me to the discovery of unsuspected ulceration, in this part and when this is fœtid, the throat should always be carefully examined. In conducting the examination it is necessary to raise the uvula, in order to see the upper part of the back of the pharynx, as ulcers are not uncommon here, and may otherwise be overlooked. It is important to determine the nature of any ulceration of the throat, and especially whether it is of a syphilitic character.

PROGNOSIS.—Ulceration of the throat may prove immediately dangerous, in consequence of interfering with deglutition, and thus affecting nutrition; spreading to the larynx; giving rise to hæmorrhage; or inducing septicæmia. Some forms are difficult to cure. The destructive effects of ulceration may lead to serious permanent mischief.

TREATMENT.—*Local.* For most ulcerations of the throat nothing answers better than the frequent use of *chlorate of potash* as a gargle (ʒ ij—iij to Oj); or in the form of lozenges or spray. *Follicular* ulcers, as well as other chronic forms, often require to be freely touched with *nitrate of silver* or its solution. When the surface is sloughy, antiseptic gargles must be abundantly employed, such as one containing *Condy's fluid, carbolic acid, creosote,* or *chlorine,* and they may be used alternately with the *chlorate of potash* gargle. In *gangrenous* forms of ulceration exhibiting a tendency to spread, it is advisable to start by brushing the surface over carefully with strong *nitric* or *hydrochloric acid*, then proceeding with the other applications. Inhalations containing *carbolic acid*, *creosote*, or other antiseptics are also very valuable.

General. It is very important before commencing treatment to determine the nature of any throat-ulceration, and especially whether it is due to syphilis. If such is the case, *iodide of potassium* with *decoction of cinchona bark* or *quinine* generally produces the best results. Sometimes a course of *mercury* is required, but it must be conducted with care. It will often be found, even in syphilitic cases where there is much sloughing, that *dilute nitric acid* with *decoction of bark* brings about rapid improvement, and this mixture is very useful in other forms of gangrenous ulceration. *Tincture of steel* in doses of ♏xx—xl every four or six hours is also exceedingly valuable, especially if there is much debility, and it may be combined with *quinine*. The internal administration of *chlorate of potash* is recommended as a specific remedy in throat-ulcerations. It has appeared to me to answer just as well if freely employed locally, but it may be given as a drink. Dr. Sansom advocates the use of the *sulpho-carbolates*.

Not uncommonly one of the most important matters requiring attention is the feeding of the patient. In many cases, owing to great difficulty or pain being experienced in swallowing, very little or no nourishment is taken, and hence the system becomes greatly lowered, so that healthy action cannot take place, and the ulceration will not heal. Under these circumstances the patient must be compelled to take small quantities of beef-tea and milk at frequent intervals, and in this way a considerable amount of nutriment may be administered. If this is persevered in for a short time, the patient generally becomes able to swallow easily, and there is a marked effect for good produced on the ulceration. At the same time a good quantity of port-wine should be given in similar small doses. If deglutition is really impossible, nutrient enemata must be employed.

When there is much dyspnœa accompanying throat-ulceration, the patient must be carefully watched, as remarkably sudden death may occur from suffocation, and laryngotomy or tracheotomy may be called for at a moment's notice. Indeed, in cases attended with great danger it is decidedly advisable to open the larynx as a precautionary measure, so that there may be no fear of sudden death, while at the same time the ulcerated structures are left in a state of rest, and therefore in a more favourable condition for undergoing the healing process.

III. Chronic Affections of the Throat.

1. Chronic Pharyngeal Catarrh.—This is a very common condition, the symptoms being uneasiness or soreness of the throat, increased by irritating substances; roughness or huskiness of the voice; a frequent desire to clear the throat; hawking and cough, especially in the mornings, there being much difficulty in removing the secretion which forms. Examination reveals redness, frequently

with permanent enlargement of the vessels; a rough and granular appearance—*granular sore-throat;* or numerous enlarged follicles—*follicular sore-throat,* or raised hard papules of considerable size; generally much thick sticky secretion; and superficial erosions or ulcerations, or follicular ulcers. Chronic pharyngeal catarrh is often associated with disorders of the stomach; phthisis; chronic alcoholism; excessive smoking; too much talking or singing; or a relaxed uvula.

2. Relaxed Mucous Membrane is frequently the cause of unpleasant throat-symptoms, and it either follows pharyngeal catarrh; or is associated with general debility. A quantity of secretion forms on the surface of the fauces, which excites cough. A *relaxed* and *elongated uvula* gives rise to very uncomfortable sensations, with a tickling cough, which comes on particularly when the patient lies down at night, owing to the uvula falling back and causing irritation. It may excite nausea and vomiting.

3. Chronic Enlargement of the Tonsils.—Enlargement of the tonsils beginning during very early life is liable to lead to serious results, and, therefore, when examining children it is always desirable to ascertain the condition of their tonsils, especially if they are rickety, tubercular, or strumous. Its pathological causes are:—1. *Chronic inflammation,* either following acute tonsillitis, especially after several attacks; or coming on gradually. 2. Persistent or frequently-repeated *congestion.* 3. *Albuminoid disease.*

The chief symptoms of enlarged tonsils are difficulty of deglutition; and alteration of the voice. Breathing is not uncommonly interfered with, and the report frequently is "that the child makes a great noise when asleep," snoring loudly. In course of time deformity of the chest may result in very young subjects, from the obstruction to the entrance of air into the lungs. Deafness is not an unusual symptom. On inspection the tonsils are seen to be more or less enlarged, and they may meet in the middle line. There is no particular redness, but the surface appears granular or irregular, and white opaque accumulations of secretion are often observed upon it. The tonsils feel unusually firm and hard. The general health is in most cases below par, and nutrition is interfered with, so that growth and development do not proceed properly. Chronically enlarged tonsils are not uncommonly liable to acute exacerbations from time to time.

4. *Polypi* and various other *morbid growths,* benign or malignant, are in rare instances met with in the throat. They cause more or less unpleasant local sensations, with obstruction to deglutition or breathing, and abundant secretion may be hawked or coughed up. Sometimes hæmorrhage takes place. The nature of any growth is revealed on examination; and it may sometimes be felt when it cannot be seen.

Diagnosis.—All that need be said here is that chronic affections of the throat may be simulated in nervous people when there is nothing really wrong; and that certain symptoms which are attributed to other diseases are not uncommonly due to some abnormal condition of this part, which has been overlooked. This remark applies particularly to cough. The habit of always examining the throat when such symptoms are present will guard against this error.

Prognosis.—Chronic throat-complaints are not often dangerous in themselves, but they frequently cause much annoyance, and may be very difficult to get rid of.

Treatment.—In treating any chronic throat-affection, it is requisite first of all to find out its *cause*, and to remove this, if possible. Intemperance in drink; excessive smoking; the habitual use of hot spices and condiments in excess; or too much speaking in public or singing, must be put a stop to. At the same time it is often important to improve the general health by careful attention to hygienic conditions and diet, especially in the case of children suffer-from enlarged tonsils, for whom a change to the seaside often proves beneficial. If the alimentary canal is out of order, it must be attended to. The internal administration of *quinine* and *iron*, *acids* with *bitter infusions*, or *nux vomica* or *strychnia*, frequently does much good. *Steel-wine* and *cod-liver oil* are very useful when the tonsils are chronically enlarged.

Local treatment is essential. The regular and efficient employment of astringent applications is generally called for, in the form of gargles, glycerines or solutions applied with a brush, spray, lozenges, or powders. The most serviceable topical remedies are *alum*, *tannin*, *dilute mineral acids*, *tincture of capsicum*, *catechu*, *tincture of steel*, *sulphate of zinc*, or *nitrate of silver*. *Infusion of roses* with *dilute sulphuric acid* and *tincture of capsicum* constitutes an agreeable and efficient gargle. *Glycerine of tannin* is a very useful application in many chronic conditions of the throat. It may be necessary to puncture follicles, and then touch them with *nitrate of silver;* or to snip off an elongated uvula. When the tonsils are enlarged, the regular application of strong *glycerine of tannin*, *nitrate of silver*, or *tincture of iodine* may be tried, but generally these are quite ineffectual, and the tonsils have to be excised. After excision, it is necessary to see that the tonsils heal properly, as they are apt to remain in a painful state for some time. If the chest is becoming deformed, there should be no delay in removing the tonsils. Morbid growths may also need excision.

IV. Retro-pharyngeal Abscess.

This is a very rare affection, which may be either *acute* or *chronic*, and occurs under the following circumstances:—1. As a *complication* or *sequela* of the acute specific fevers. 2. In *pyæmia*. 3. As the result of *local injury* or *disease*, *e.g.*, caries of the cervical vertebræ or disease of the laryngeal cartilages. 4. Extremely rarely as the termination of a *primary inflammation*.

Symptoms.—The symptoms of retro-pharyngeal abscess are pain at the back of the pharynx; much difficulty in swallowing, food and drink returning by the nose; alteration in the voice; cough; and often great dyspnœa, with a sense of suffocation. The abscess may be seen or felt in the pharynx, or it may form an external enlargement; and after a time fluctuation can be detected in most instances.

Treatment.—This consists in at once letting out the pus by careful incision; and keeping up the strength of the patient by nutritious diet, stimulants, and tonics.

Chapter III.

DISEASES OF THE ŒSOPHAGUS.

Clinical Characters.

The clinical phenomena which are to be looked for as indicative of œsophageal affections include:—

1. *Morbid sensations*, namely, pain, which generally seems to lie deep in the chest, as if between the shoulders, and fixed in some particular spot; as well as other abnormal sensations, such as fulness, tightness, oppression, burning, or a feeling of obstruction by a foreign body.

2. *Pain or difficulty during deglutition.* When this symptom is noticed, enquiry must be made with regard to its degree; whether the difficulty can be overcome by repeated efforts; if it can be localized in any particular spot; whether it has come on gradually and steadily increased or suddenly, and if it is constant or only paroxysmal, associated or not with the taking of food; if it is influenced by the liquid or solid character of things swallowed, the size of solids, hot or cold substances, or special articles of diet; and whether the act is aided by any particular position.

3. *Rejection* of various substances, such as food, mucus, blood, exudation, pus, &c., either by mere regurgitation, by spasmodic action, or by vomiting. This may occur immediately after taking food; or only after an interval, a large quantity being then discharged, as if the materials had been accumulating for some time. Food which has remained in the œsophagus instead of entering the stomach has an alkaline reaction, and is macerated and decomposed, instead of having undergone the digestive process.

4. Signs revealed on *physical examination.* Physical examination often aids materially in the investigation of œsophageal affections. This includes:—*a.* A full *inspection of the throat.* *b.* The passage of an *œsophageal bougie*, which must be done cautiously. By the use of this instrument important information may be obtained. (i.) It enables the practitioner to ascertain if there is any actual obstruction, as well as its seat and degree; whether such obstruction is constant and increasing, or only present from time to time; and if it can be overcome by continuous moderate pressure, yielding more or less suddenly. (ii.) Should there be obstruction, the actual shape of the obstructed part may be determined by making the bougie warm and soft, and thus getting a mould of the passage.

(iii.) Frequently the bougie brings up materials on its surface, such as blood, pus, or cancer-cells, which should then be examined microscopically. (iv.) Occasionally the bougie may be felt to pass round something, such as a polypus. *c. Auscultation.* This is sometimes useful, for when the stethoscope is applied in the course of the œsophagus behind, and the patient is made to swallow, a sound may be produced should any obstruction be present, as if something were passing through a narrowed portion into a wider part beyond. Dr. Clifford Allbutt has drawn special attention to the value of œsophageal auscultation. *d. External examination*:—(i.) For any swelling in the neck or elsewhere in the course of the gullet, which might indicate dilatation or sacculation of this tube; at the same time noticing whether any such enlargement is influenced by taking food or drink, or by the act of vomiting or retching. (ii.) For any tumour in the neck or chest likely to influence the functions of the œsophagus, by exerting pressure upon it or upon its nerves.

SPECIAL DISEASES.

I. ACUTE ŒSOPHAGITIS.

ÆTIOLOGY.—Œsophagitis may arise:—1. As a simple *catarrhal* inflammation, along with catarrh of other mucous membranes. 2. From *direct injury* by foreign bodies. 3. From *irritation* or *corrosion* by chemical substances, such as acids, alkalis, corrosive sublimate; also by very hot or cold articles. 4. By *extension* of thrush or diphtheria, when the characteristic deposits are met with. 5. As a *complication* of the specific fevers, cholera, pyæmia, and other acute affections. 6. In connection with local *organic diseases*, such as ulcer or stricture.

ANATOMICAL CHARACTERS—There are the usual signs of inflammation, viz., redness and swelling of the mucous membrane; diminution in consistence; and the presence of various deposits on the surface, differing according to the nature of the inflammation. Occasionally ulceration is seen, and superficial erosions are common; while, if the inflammation is caused by corrosives, there may be much destruction of tissue. As a rare event pus forms beneath the mucous membrane.

SYMPTOMS.—More or less pain is felt, which lies deep in the chest, along the course of the œsophagus, and which may extend to the epigastrium. If ulceration occurs the pain is very severe at the corresponding spot. Deglutition is difficult and painful, food and drink being ejected either immediately by spasm, or subsequently by vomiting, along with much mucus, or sometimes with blood, pus, membranous shreds, or casts. In severe cases there may be great distress, with an urgent sense of oppression about the chest. The *general* symptoms are of a febrile character; and there is much thirst. Should the œsophagus be corroded or ulcerated, perforation may possibly take place, indicated by its special symptoms.

TREATMENT.—In mild cases no special treatment is required. In severe forms of œsophagitis all that can be done is to let the patient suck ice freely; to give only liquid and mucilaginous diet in small quantities, or, if there is corrosion, to employ nutrient enemata, so that the œsophagus may be left entirely at rest; to apply hot fomentations externally; and to administer *opium* in order to relieve pain and to procure rest.

II. CHRONIC DISEASES OF THE ŒSOPHAGUS.

These are of much importance, and may be described under:—A. FUNCTIONAL DERANGEMENTS. B. ORGANIC DISEASES.

A. FUNCTIONAL DERANGEMENTS.

1. PARALYSIS.—This extremely rare condition is met with only in certain nervous affections, viz., in general paralysis of the insane; progressive muscular atrophy; some cases of brain-disease; the paralysis which follows diphtheria; hysteria; or in glosso-pharyngeal paralysis.

SYMPTOMS.—Dysphagia is the only symptom of œsophageal paralysis, which is particularly felt with regard to liquids, these tending to pass into the larynx. Solids, especially large pieces, are more easily swallowed; and the erect posture facilitates the act of deglutition. The bougie can be passed quite readily.

2. ŒSOPHAGISMUS OR SPASM.—A slight degree of œsophageal spasm is not at all infrequent; but sometimes this condition gives rise to much distress, inducing complete obstruction.

ÆTIOLOGY.—The causes of œsophagismus are:—1. Most commonly some nervous condition, especially hysteria and hypochondriasis. 2. Brain-disease very rarely. 3. Local irritation, especially that of an ulcer. 4. Occasionally dyspepsia with flatulence. 5. Pressure upon the nerves of the œsophagus. 6. Abuse of alcohol.

SYMPTOMS.—There may be a constant feeling of obstruction in some fixed point, as if a foreign body were impacted in the gullet, but pain is absent. When food is taken, sudden dysphagia comes on, and a stoppage is felt at a certain spot, either absolute and complete, or yielding after several efforts have been made to swallow, this event often occurring equally suddenly. The attacks are not constant in all cases, for at times deglutition may be effected comfortably. The act is often influenced by the nature and temperature of the food. Usually much discomfort is felt during the attempts at swallowing, with a sense of oppression or suffocation, and sometimes spasmodic movements of the muscles of the neck are excited, On attempting to pass a bougie its progress is stopped, but after careful continued pressure the spasm gives way, sometimes suddenly, and the instrument passes on. In the cases which have fallen under my notice the upper part of the canal was affected, but the lower end may be involved. Dyspeptic symptoms are frequently complained of, especially flatulence and eructations, which may bring on the spasm. There are no signs of wasting or of serious organic disease as a rule, but generally the patient is distinctly hysterical or hypochondriacal. Should œsophagismus be due to a tumour pressing on the nerves of the œsophagus, this will probably be revealed by physical signs.

B. Organic Diseases.

1. Chronic Ulceration.—An ulcer is occasionally seen in the œsophagus, presenting characters similar to those observed in gastric ulcer, which will be hereafter described. It is liable to give way and to cause perforation.

Symptoms.—Usually considerable localized pain is experienced, which is of a burning character. Deglutition is very painful and difficult, or may even be impracticable, chiefly on account of spasm, and this is sometimes the only symptom observed. Blood and mucus may be expelled, or brought away on the bougie. Great care must be exercised in using this instrument if there is any reason to suspect ulceration.

2. Stricture and Obstruction.—The conditions which may cause narrowing or complete closure of the tube of the œsophagus may be thus enumerated:—

(i.) *Organic changes in its walls*, viz.:—*a.* Cancerous infiltration. *b.* Cicatricial thickening and contraction after wounds, ulcers, or corrosion. *c.* Hypertrophy of the coats, especially of the submucous cellular tissue; or exudation and thickening, as the result of chronic inflammation. *d.* Syphilitic growths. *e.* Ulceration, with induration and swelling of the margins of the ulcer.

(ii.) *External pressure* from:—*a.* An enlarged thyroid gland. *b.* Enlarged lymphatic glands in the neck or chest. *c.* Various tumours or growths in the neighbourhood, such as cancer, fibrous tumours, exostoses; as well as aneurisms and abscesses. *d.* Great distension of the pericardium by fluid.

(iii.) *Growths projecting inwards from the walls of the œsophagus, or from without*, these being generally either cancerous, fibrous, or of the nature of polypi.

Anatomical Characters. The morbid appearances will necessarily vary according to the cause of the obstruction. After a time the gullet becomes dilated and hypertrophied above the seat of any obstruction, and in this distended portion food is apt to accumulate, causing irritation, ulceration, and sometimes perforation. The mucous membrane is also liable to ulcerate at the point of stricture. Below this point the tube usually becomes narrowed and atrophied.

Symptoms—Dysphagia is the chief symptom of organic obstruction of the œsophagus, and a feeling is experienced as if the food always stops at a certain spot, which in the great majority of cases lies behind the upper piece of the sternum. At first the difficulty is only slight, but it increases, usually gradually and slowly, until at last nothing whatever will pass. Liquids and soft pulpy substances are far more easily swallowed than solids, especially when these are in large pieces; hence patients suffering from this disease learn to chew their food thoroughly. If a good-sized lump can be got through the obstruction, matters will then pass more readily for a time. Food is either immediately regurgitated or spasmodically rejected; or it is retained in a dilatation for some time, and then discharged in large quantities, being almost always alkaline in reaction, as well as sodden and decomposed. A good deal of mucus is brought up, and sometimes blood or pus, should there be ulceration. Pain is frequently absent or very slight, but if cancer or an ulcer is present, it is commonly severe. A sense of pressure and weight in the chest is often complained of. If the obstruction is seated near the lower end of the œsophagus, the symptoms may appear to be associated with the stomach.

In proportion to the difficulty experienced in taking nourishment, there will be more or less emaciation and weakness, these symptoms being in many cases extreme, the abdomen becoming greatly retracted, and the patient exhibiting all the signs of starvation, at the same time being often very hungry and thirsty.

The use of the bougie gives accurate information as to the actual existence, position, degree, shape, and rate of progress of any stricture or obstruction. It may also reveal its cause, by the substances which it brings up. Auscultation may afford some aid in diagnosis. A tumour usually gives rise to symptoms of pressure on surrounding structures; as well as to external physical signs.

3. Cancer.—It is requisite to make a few additional remarks with regard to this extremely rare disease. Males and persons of advanced years are the subjects in whom œsophageal cancer usually occurs.

Anatomical Characters.—The upper end of the œsophagus is involved in most cases, the lower much less frequently, and only very exceptionally the middle part. All forms of cancer are met with, the epithelial variety being most frequent above, and scirrhus near the cardiac orifice; the growth may infiltrate the coats and extend throughout the entire circumference, or it may form a distinct tumour. The affected part is thickened, constricted, hard and irregular, aud ulceration of the mucous surface is liable to occur. The submucous tissue is that in which the formation is first observed. The glands in the neighbourhood are generally cancerous, but other organs are not often implicated.

Symptoms.—In addition to symptoms pointing to œsophageal obstruction, there is much pain, generally localized, but also shooting along the side, or upwards, or backwards between the scapulæ. The bougie may bring up cancer-cells, or these structures may be discovered in the materials rejected. Signs of pressure are usually evident, especially dyspnœa. Dyspeptic symptoms, with pyrosis and eructations, are common, and may be present for some time before any local signs of the disease appear. Great wasting and debility are generally observed, with œdema of the legs; and the cancerous cachexia may be well-marked. Œsophageal cancer has almost always a short duration, the average being about thirteen months.

4. Dilatation or Pouching.—The œsophagus may be dilated in

its whole circumference; or a hernia or sacculation may form on one side. This condition arises from:—(i.) Some obstruction most commonly. (ii.) Lodgment of a foreign body. (iii.) Paralysis from chronic catarrh. (iv.) No evident cause. An œsophageal pouch may form a tumour in the neck, influenced as to its size and other characters by taking food or drink, or by vomiting. Substances collect in the dilatation, and are afterwards discharged at variable intervals.

5. Perforation.—The œsophagus may be perforated from within, as the result of ulceration, cancer, corrosive destruction, or injury by a foreign body; or from without, by an aortic aneurism, an abscess, or a glandular or other tumour. The perforation may take place into various parts, and the symptoms will vary accordingly. It is generally accompanied with signs of collapse.

General Diagnosis, Prognosis, and Treatment of Chronic Œsophageal Diseases.

Diagnosis.—When a case occurs in which symptoms point to the œsophagus, the diagnosis has to determine:—1. Whether this tube is itself organically or functionally affected; or is interfered with by some neighbouring tumour or other morbid condition. 2. The nature and origin of the disease—if organic, whether cancerous, &c.; if functional, whether of the nature of paralysis or spasm. 3. The seat of the morbid condition, as regards the part of the tube involved.

It is often very difficult to determine the actual conditions present, and in order to arrive at a correct diagnosis the following points must be carefully taken into account:—1. The general and family history of the patient; the conditions as regards age and other circumstances; as well as the history of the complaint, with respect to its cause, previous duration, and course. 2. The general state of the patient, especially as to the degree of emaciation and debility, and the presence of any diathesis. 3. The degree, characters, and situation of the local symptoms, particular attention being paid to deglutition, from which important information may be gained. 4. The knowledge conveyed by the use of the bougie, which is often very accurate and decisive; as well as by the other modes of physical examination employed, especially with a view of determining whether any tumour exists in the vicinity of the œsophagus. 5. If any signs of adjacent pressure are present. 6. The state of the nervous system. 7 The condition of the stomach. 8. The progress of the case. The descriptions already given will sufficiently indicate how the several diseases of the œsophagus differ in these respects.

Prognosis.—Spasmodic affections of the œsophagus are not dangerous as a rule, but they are often exceedingly difficult to cure. Paralysis is very serious in most cases, being a part of some grave nervous disease. In all organic diseases of the gullet the prognosis is highly unfavourable. In ulceration the chief dangers result from perforation; or from stricture after healing. Every form of obstruction involves an unfavourable prognosis, and when cancer exists a speedy termination may be foretold. In some of the conditions which cause obstruction the prognosis depends partly on the effects of treatment.

TREATMENT.—1. The *general condition* of the patient must be attended to. If a hysterical condition is evident, *assafœtida*, *aloetics*, *iron*, and *valerianate of zinc* are indicated. In cases of serious nervous disease, *strychnine* and electricity are of most service, but generally little or no good can be done. Attention to *diet* is most essential if there is any actual obstruction; liquid or pulpy nourishing food must be administered in sufficient quantities, and the patient should be fed at intervals by means of the stomach pump. At last nutrient enemata have generally to be employed, and should there be ulceration, they are decidedly indicated at an early period, so that the ulcer may not be irritated, and may be allowed to heal. Any special diathesis, such as syphilis, must have its appropriate remedies. Dyspeptic symptoms frequently require attention. The strength must be kept up by tonics, *cod-liver oil*, and stimulants, as well as by food.

2. External *local applications* sometimes do good in œsophagismus, such as a blister over the sternum, a *belladonna plaster*, or friction with *belladonna liniment*. Probably these act by exerting a mental influence. No local treatment has any effect whatever upon other conditions of the œsophagus.

3. The *bougie* is most valuable in treatment, as well as in diagnosis. The threat of its use sometimes does good in spasmodic cases; and its regular employment often leads to much improvement in such cases. By its aid œsophageal strictures can often be dilated, but great care must be exercised in passing the instrument, especially if an ulcer is present.

4. Various *symptoms*, such as pain, sleeplessness, or vomiting, frequently call for special treatment, for instance the administration of *opium*, *morphia*, or other narcotics; the application of local heat or ice; and other remedial measures.

5. In some instances the advisability of performing *œsophagotomy* or *gastrotomy* has to be considered.

CHAPTER IV.

DISEASES OF THE RESPIRATORY ORGANS.

CLINICAL CHARACTERS.

THE clinical phenomena associated with the respiratory organs vary in their precise characters according to the part affected, and the nature of the disease; but the following outline will serve to indicate their general features.

1. *Morbid sensations* are very commonly complained of. When the larynx or trachea is involved, these sensations are referred to this

portion of the respiratory tract, and they include chiefly mere uneasiness, soreness, or actual pain of variable characters; a sense of burning; irritation; or a feeling as if a foreign body were present. They are often increased by acts causing local disturbance, such as coughing, speaking, or singing. There may be external tenderness over the larynx, especially on making pressure directly backwards. In affections of the bronchi, lungs, or pleura, pain or some other morbid sensation is generally experienced over some part of the chest, upon which it is always important to observe the effects of cough and of deep inspiration.

2. *Breathing* is frequently disturbed in some way or other, there being some form of *dyspnœa*. Any obstruction in the main air-tube causes serious interference with respiration, and hence in laryngeal and tracheal diseases breathing is frequently noisy, hissing, whistling, or stridulous; at the same time being prolonged and laboured; while there may be signs of urgent dyspnœa, with indications that little or no air enters the lungs during inspiration, especially in the case of young children. In certain conditions expiration is undisturbed. Laryngeal dyspnœa may be constant or only paroxysmal, sometimes coming on very suddenly, and being always liable to exacerbations. As regards other portions of the respiratory apparatus, the characters of the disorder of breathing will vary with the nature of the disease.

3. Certain *acts* are excited, which have for their object the *removal of some source of irritation* in connection with the respiratory tract. The most important of these is *cough*, but *sneezing* and *hawking* also come under this head, the former being excited by some irritation in the nasal passages, the latter by a similar condition in the larynx or throat. Cough differs in its characters according to its cause. Laryngeal cough is peculiar and characteristic, being irritable and liable to come on in distressing fits; difficult to repress; hard, hoarse, cracked, croupous, metallic, or barking in quality, or occasionally aphonic. In many cases of laryngeal disease there is a constant desire to cough or hawk, in consequence of a sense of persistent irritation or obstruction being experienced.

4. The expulsive acts just alluded to are frequently attended with the discharge of various substances, technically termed *expectoration* or *sputa*. These may consist of mucus; muco-purulent matter; actual pus; croupous or diphtheritic exudation; portions of morbid structures, or of the tissues of the air-passages or lungs; calcareous particles: or other materials.

5. *Hæmoptysis* or *spitting of blood* demands notice as a special form of expectoration, this being a symptom of considerable importance.

6. The *voice* is liable to more or less alteration in its characters when the larynx is implicated. It may be weak to complete aphonia; altered in quality, being rough, harsh, hoarse, croupy, or cracked; or changed in pitch or range.

7. Occasionally the *expired air* presents abnormal characters.

8. In diseases affecting the larynx, *deglutition* may be somewhat uneasy or painful, and if the epiglottis is destroyed, the act of swallowing becomes difficult, objects being apt to pass into the air-

assages. In exceptional cases of certain lung-affections the atient may also experience some difficulty in deglutition, this being robably due to reflex nervous disturbance.

9. The *general aspect* and *posture* of the patient often afford important indications in connection with diseases of the respiratory organs, and therefore should always receive particular attention.

PHYSICAL EXAMINATION.

Physical examination constitutes an essential and most important part of clinical investigation directed to the respiratory organs, and this subject needs therefore to be discussed as fully and completely as the limits of this work permit, though it will be impossible to enter into lengthy details.

A. EXAMINATION OF THE LARYNX AND TRACHEA.

Physical examination directed to the investigation of morbid conditions affecting the larynx or trachea includes:—

1. *External examination of the neck.* This may reveal, for example, the presence of any tumour interfering with the main air-tube, or a fistulous communication with its interior. Direct examination over the larynx and trachea, by means of *palpation* and *auscultation* more especially, may also be useful, the latter method detecting alterations in the breath-sounds, or revealing local rhonchi.

2. *Examination of the throat internally.* Much information is often gained by inspecting this part with a good light, as in many cases the throat and larynx are affected with similar morbid conditions. The state of the epiglottis can also be frequently made out in this manner; or it may be felt by the finger.

3. *Examination of the chest.* This will show whether there is any obstruction to the entrance of air into the lungs; or if there is any tumour in the thorax, disturbing the functions of the air-tubes.

4. *Examination with the laryngoscope.* The laryngoscope is the special instrument employed for determining the state of the upper part of the windpipe, and although it is possible in many instances to come to a tolerably accurate conclusion on this matter without its aid, yet the exact conditions present can only be ascertained by the use of this apparatus. It is also valuable for the purpose of applying local remedies, and in the performance of operations. Much practice is required before the laryngoscope can be effectually employed.

The *laryngoscope* consists of an apparatus for illuminating the back of the throat; and a small mirror, which is introduced into this region in such a way as to reflect an image of the interior of the larynx. Illumination is usually accomplished by *reflection*, a mirror being attached to the observer's head in various ways, which is made to reflect either solar light, or, more commonly, light derived from some artificial source. Numerous lamps have been invented, of which one of the best is the "rack-movement lamp" of Dr. Morell-Mackenzie; but any lamp which yields a clear, strong, and steady light will suffice for ordinary purposes. Some laryngoscopists employ *direct illumination*, by means of a lamp placed on a narrow table between the operator and the patient, having a powerful lens directed towards the latter, and being screened towards the former. The oxy-hydrogen light answers best for this method of illumination. The *throat-mirrors* ordinarily used are circular, varying in diameter from half-an-inch to an inch; but if the tonsils are enlarged, oval or ovoid mirrors may be employed. They should be made of glass backed with a coating of silver; mounted in German silver; and fixed at an angle of about 120° to a slender shank, which is inserted into a handle.

Mode of examination. The patient sits opposite the observer, with the head inclined very slightly backwards, an interval of about a foot being left between their faces. The lamp is placed at the side of the patient, the flame being on a level with the eyes. The mouth being opened as widely as possible, and the tongue protruded, this is held gently between the thumb and forefinger of the left hand, covered with a handkerchief or a soft napkin. By means of the reflector the light is then directed to the back of the throat, so that the centre of the disc corresponds to the base of the uvula. The throat-mirror, having been properly warmed over the lamp, is now introduced, being held between the thumb and fingers of the right hand; its reflecting surface is directed more or less obliquely downwards, while the opposite surface touches the base of the uvula, which should be pushed gently upwards and backwards. In order to facilitate the introduction of the mirror, it is often necessary to make the patient take a deep breath, or repeat the sound "ah." Some persons can bear examination for any length of time, if it is properly conducted, but in most cases it is better to introduce the mirror several times in succession, for a few seconds each time.

It is requisite to become familiar with the appearances observed with the laryngoscope in the healthy larynx, before this instrument can be of any service in investigating diseased conditions. The morbid conditions which may be detected are:—1. Changes in colour, due to congestion, inflammation, or other causes. 2. Alterations in the size, shape, and position of the epiglottis. 3. Thickening of tissues, with irregularity, resulting from chronic inflammation. 4. Œdematous swelling. 5. Various deposits, especially croupous. 6. Ulcerations. 7. Growths and tumours. 8. Changes in the shape and size of different parts, particularly of the opening of the glottis. 9. Derangement of the action of the muscles of the glottis, as observed during the act of breathing or vocalization.

B. EXAMINATION OF THE CHEST.

Physical examination of the chest includes that of its walls; and of its several contents. The present section will be mainly devoted to a consideration of the subject so far as it applies to the respiratory apparatus; other structures must, however, be alluded to more or less, but the examination of the heart and vessels is treated of separately, (Vol ii. pages 1—23).

There are some general points of practical importance to which it is desirable to call attention at the outset. 1. A knowledge of the anatomy and physiology of the thorax and its contents is essential before physical examination can be applied to the investigation of their morbid conditions. It is also requisite to be thoroughly familiar with the normal *physical signs*, and hence students should first practise the examination of healthy individuals. 2. When investigating for disease, the chest should be exposed to the full extent that any individual case may require. It is often necessary to strip the chest and upper part of the abdomen completely, and in the case of males and children there need be no hesitation about doing this; the examination of females must of course be conducted with due regard to decency. To make a practice of examining the thorax through garments is most objectionable. 3. The patient should assume an appropriate position, the objects aimed at being to place the superficial structures under such conditions that they will not interfere with the production or perception of the physical signs; and to enable the operator to conduct the examination in a comfortable and unrestrained attitude. Ordinarily, when the front of the chest is being examined, the patient should sit or stand with the hands hanging down by the side. A slightly stooping posture, with the head bent forward and the arms well folded across the chest, so that the scapulæ are drawn away from the spine, and the muscles are put on the stretch, answers best for the examination of the back. The sides are most conveniently reached by having the arms raised vertically above the head. Of course the position has in many cases to be modified on account of the patient being confined to bed, or being even unable to be moved. 4. The investigation ought to be carried out thoroughly and completely, whenever circumstances seem to require this, every part of the chest being explored. Certain regions, however, demand special attention, viz., those corresponding to the apices of the lungs, both in front and behind; to their bases posteriorly and laterally; and to the heart and great vessels. 5. It is most desirable that the examination should be conducted in a systematic and orderly manner. The different methods should be gone through in regular succession, the lungs being first attended to, and then the heart and vessels. In many cases it is advisable to complete the examination of a particular region before proceeding to another part of the chest. It must be remembered that the various structures within the thorax mutually affect the physical signs which they severally present; and that examination of one organ may aid in detecting some morbid condition in another. 6. Repeated examination may be needed before a satisfactory diagnosis can be arrived at. Moreover, in many acute cases the physical signs should be noted at frequent intervals, in order to observe their progress; while in those affections which are known to have a tendency to implicate the thoracic organs, these organs must be investigated as often as the nature of the case seems to require. 7. Certain conditions which influence the physical signs both in health and disease must always be taken into account. These are the state of the chest-walls, as regards the amount of fat and muscle, and the conditions of the ribs and cartilages; the form of the thorax; the part over which the examination is made; the age and sex of the individual examined; the state of the nervous system, nervousness and hysteria materially affecting the respiratory and cardiac actions; the manner in which breathing is carried on, many persons needing instruction as to how to perform this act; and the amount of air contained in the lungs, according to the stage of the respiratory act as regards inspiration and expiration. 8. When examining opposite sides of the chest, with the view of comparing them, care must be taken that the examination is made over corresponding regions, and in precisely the same manner. 9. A preliminary acquaintance with the principles or theory of physical examination is highly desirable, but the student must remember that by long-continued experience alone can he become thoroughly grounded in the practical application of these principles. 10. Physical signs are but indications of certain physical conditions; and, therefore, in order to appreciate the significance of the signs elicited in any particular disease, the abnormal physical conditions associated with such disease must be clearly understood.

Divisions of the Thorax.

For the purpose of describing the situation and limits of physical signs elicited in connection with the chest, certain imaginary lines are drawn, and regions marked off, the chief of which are as follows:—

I. *Lines.*—These are drawn vertically from the top to the bottom of the chest, and are thus named according to their position:—1. *Mid-sternal.* 2. Right and left *lateral sternal.* 3. *Nipple* or *mammary-line.* 4. *Acromial,* extending from the acromion process. 5. *Mid-axillary.* 6. *Scapular,* along the vertebral border of the scapula. 7. *Mid-spinal.*

II. *Regions.*—These may be arranged in the following manner:

1. *Median,* included within the width of the sternum:—*a. Supra-sternal,* corresponding to the depression above the sternum. *b. Upper sternal,* extending to the lower border of the third cartilages. *c. Lower sternal,* from the third cartilages to the lower end of the sternum.

2. *Antero-lateral.* bounded internally by the margin of the sternum; externally by the acromial line on each side:—*a. Supra-clavicular,* including the space above the clavicle, and bounded superiorly by a line from the outer third of this bone to the trachea. *b. Clavicular,* corresponding to the inner half or two-thirds of the clavicle. *c. Infra-clavicular,* limited below by the lower margin of the third rib. *d. Mammary,* from the third rib to the lower border of the sixth. *e. Infra-mammary,* from the sixth rib to the lower margin of the thorax.

3. *Lateral,* bounded in front by the acromial line; behind by the axillary border of the scapula:—*a. Axillary,* from the apex of the axilla down to a line continuous with the lower boundary of the

mammary region. *b. Infra-axillary*, from the above line to the lower margin of the thorax.

4. *Posterior*, from the axillary edge of the scapula to the middle line behind:—*a. Supra-spinous* or *superior scapular*, corresponding to the supra-spinous fossa of the scapula. *b. Infra-spinous* or *inferior scapular*, opposite the infra-spinous fossa. *c. Infra-scapular*, below the scapula to the margin of the thorax, and extending internally to the spine. *d. Inter-scapular*, including the space between the base of the scapula and the spinous processes of the corresponding dorsal vertebræ.

Methods and Objects of Physical Examination.

It is necessary to have a clear comprehension of the different methods of examination employed, with regard to their nature; the manner in which they are severally performed; and what each is capable of teaching; therefore a brief outline of this part of the subject will now be given.

I. Inspection.—This merely signifies "the act of looking," and all that need be said about the mode of conducting it is, that different views of the chest must be taken, from the sides and behind as well as from the front; and that a good light should be obtained. *Inspection* reveals:—1. The state of the *superficial parts*, as regards colour, œdema, amount of fat, fulness of the veins, and other conditions. 2. The *shape* and *size* of the thorax, along with which may be noted the state of the supra-sternal and supra-clavicular depressions; the direction of the ribs; the characters of the intercostal spaces; the size of the costal angles (*i.e.*, the angle between the ensiform cartilage and the contiguous rib-cartilages on each side); and the relative height of the shoulders. 3. The frequency, extent, and characters of the *respiratory movements*.

II. Palpation or Application of the Hand.—The palmar surface of the hand and fingers is applied to the chest, in order to appreciate certain impressions which are capable of being conveyed by the sense of touch. In some cases it may be necessary to grasp the sides, particularly in the examination of children; in others only the tips of the fingers need be used, especially when it is desired to localize the signs; but generally it is best to feel with as much of the hand as can be applied. The objects of *palpation* are:—1, To give more accurate information with regard to what is revealed by inspection. 2. To determine the existence and characters of various kinds of *fremitus*. This term comprehends certain tactile sensations conveyed to the surface of the chest, and which are classed as:—(i.) *Vocal fremitus*, produced by the act of speaking or crying. (ii.) *Tussive fremitus*, originated by coughing. (iii.) *Rhonchal fremitus*, due to the passage of air during the act of breathing through the air-tubes, when certain physical conditions are present. (iv.) *Friction fremitus*, elicited by the rubbing together of roughened surfaces of the pleura. 3. To detect the presence of any *fluctuation;* or of *succussion-movement*.

III. Mensuration or Measurement.—In some cases it is important to obtain accurate information as to the size and shape of the chest; and the extent of the respiratory movements. For this purpose certain measurements are taken, either while the chest is at rest, or in different states as regards expiration and inspiration. The only measurements likely to be required are:—1. *Circular* or *circumferential*, in different parts of the chest. 2. *Semi-circular*, so as to compare the two sides. 3. *Antero-posterior*, in the middle line and on either side, especially under the clavicles; and *transverse;* also noticing the relations of these two diameters. 4. *Vertical*, from the middle of the clavicle to the lower margin of the thorax. 5. *Local*, particularly from the nipple to the mid-sternal line; and from the same point to the clavicle on each side. The requisite instruments include an ordinary tape-measure; a double tape-measure, made by uniting two tapes in such a manner that they start from the same point, which is useful for comparing the two sides, the point of junction being applied to the middle line behind, and the tapes drawn round, one on each side of the chest, until they meet in the mid-sternal line; and different movable calipers, by which the diameters are taken. Several ingenious instruments have been invented for the purpose of indicating the respiratory movements very precisely, but they are of little practical value.

In some instances it is essential to get an outline of the shape as well as of the size of the two sides of the chest in different parts, in order to determine the exact capacity of each half, as this depends much on the form, the measurement being sometimes actually less on the side which has the larger sectional area and volume. This is accomplished by means of the *cyrtometer*, and a convenient form of this instrument consists of two portions of flexible lead-tubing of small calibre, united by a short piece of india-rubber tubing. The latter is fixed over the spine, and the two parts of lead-tubing are brought round the sides until they meet in the middle line in front. When the apparatus is removed it indicates the shape as well as the size of each lateral half of the chest, and the outline may then be traced on paper. Another kind of measurement which may be here mentioned is that by which it is sought to ascertain the vital capacity of the lungs, some form of *spirometer* being employed. This instrument is more of physiological interest than of practical value in the diagnosis of pulmonary affections.

IV. Percussion.—By this term is meant "the act of striking," and it affords signs of the highest value in diagnosis. There are two ways of performing percussion, viz., first, by striking the part under examination immediately, which is called *immediate* or *direct* percussion; secondly, by placing something on the surface, technically named a *pleximeter*, and percussing over this, which is termed *mediate* or *indirect* percussion. As a rule the latter mode should be employed, but the former is useful sometimes, especially when percussing over a bone, such as the clavicle. A great deal of discussion has been carried on as to the relative value of instruments or of the fingers in percussion. Some practitioners use plates of ivory or other materials to place on the chest; and a light flexible hammer or *plessor* to strike with. Other instruments are also employed, but without entering into any discussion on the subject, I venture to express the opinion that the use of the fingers is much preferable, and answers every necessary purpose. The following description may give some notion as to how this mode of examination is to be conducted:—One of the fingers of the left hand should be used as the pleximeter, especially the fore- or middle-finger, but the little finger is conveniently applied when percussing above the clavicle. It must be laid on evenly and firmly, with the palmar aspect next the surface of the chest. Percussion must then be made with the ends of the fingers of the right hand, the nails being appropriately shortened. Some authorities percuss with all the fingers, either arranged in a line, or gathered into a cone with the thumb; others employ only three, two, or one. It is well to practise all methods, but ordinarily the fore- and middle-fingers together answer best, or in light percussion the middle-finger may be used alone. The force employed must vary according to circumstances, but usually it should only be moderate. The stroke should be made perpendicularly to the surface; from the wrist; quickly and sharply; the fingers not being allowed to remain on for too long a time.

The objects of percussion are:—1. To elicit certain *sounds*. 2. To bring out different *sensations*, such as the amount of resistance, elasticity, fluctuation, &c. These physical signs will be considered in detail further on.

V. Auscultation.—This signifies the "act of listening," which may also be performed in two ways. The ear may be applied to the chest either directly, or with only the intervention of a handkerchief or towel, which is termed *immediate* or *direct* auscultation; or the *stethoscope* may be employed as a medium of communication between the part to be examined and the ear of the operator, this mode of examination constituting *mediate* or *indirect* auscultation. For many reasons the latter method should be adopted as a rule; but the former is often practised with advantage, especially in the examination of children, and when it is necessary to auscult over the back. It is impossible to enter here into any discussion with regard to the numerous stethoscopes which have been recommended. A great deal more depends upon the ability to auscult, and a knowledge of what is to be heard, than on the kind of instrument employed; and any simple ordinary stethoscope answers perfectly well, if the auscultator is competent. A convenient instrument is one made of a single piece of wood, such as deal or cedar, with a moderate-sized hollow stem, a well-fitting and slightly-hollowed ear-piece, and a rather small chest-extremity, which will fit into the intercostal spaces. In using the stethoscope, care must be taken that the chest-end is applied in its whole circumference, without undue pressure; and also that the ear is properly placed on the ear-piece. During auscultation the instrument must not be held by the fingers; and care must be taken that it is not touched by clothing or any other article which might occasion abnormal sounds.

So far as the *respiratory organs* are concerned, the objects of auscultation are to investigate *sounds*, viz.:—1. The *respiratory* or *breath-sounds*. 2. *Râles* or *rhonchi*, which include adventitious sounds originating in the lungs from certain abnormal physical conditions. 3. *Friction-sounds*, due to the rubbing together of roughened surfaces of the pleura. 4. Certain peculiar sounds, viz., *metallic tinkling*, *amphoric echo*, and the *bell-sound*, which are met with in rare conditions of the lungs or pleuræ. 5. *Vocal resonance*, or the sound produced during the act of speaking or crying. 6. *Tussive resonance*, or the sound elicited by the act of coughing.

VI. SUCCUSSION.—This mode of examination is rarely required, and it simply means "shaking the patient," when a *splashing sensation* is felt, or a *splashing sound* is heard in exceptional cases, where a mixture of air and fluid exists in the pleural cavity.

VII. DETERMINATION OF THE DISPLACEMENT OF ORGANS is ordinarily ranked as a special method of examination, but in reality it is merely a conclusion founded on the information derived from some of the other modes already considered. At the same time displacement of organs, both thoracic and abdominal, often gives most valuable aid in the diagnosis of abnormal conditions.

VIII. THE USE OF THE ASPIRATEUR OR TROCHAR may be classed as a mode of examination, as these instruments occasionally afford most important assistance in the diagnosis of morbid conditions within the chest.

Other modes of examination have been described, but they are not of sufficient practical value to call for notice in this work.

SPECIAL PHYSICAL SIGNS.

Having given this outline of the modes of examination, the special physical signs will now be considered, as follows:—I. SHAPE AND SIZE OF THE CHEST. II. MOVEMENTS OF RESPIRATION. III. VARIOUS KINDS OF FREMITUS. IV. PERCUSSION-SIGNS. V. AUSCULTATION-SIGNS. VI. SUCCUSSION.

I. SHAPE AND SIZE OF THE CHEST.

The size and shape of the chest are ascertained by *inspection*, *palpation*, and *measurement*. They may be considered together, as they generally bear a close relation to each other, the thorax being larger in proportion as it approaches the circular form; while both its capacity and its shape depend considerably on the direction of the ribs, and on their relative position. In healthy children the thorax is comparatively large, and nearly circular in form; in adults it is usually more or less elliptical during ordinary breathing, the long diameter being transverse. Many diversities of form may, however, be observed within the range of health, and though there ought to be no obvious want of symmetry between the two sides, slight differences can generally be detected.

A. DEVIATIONS FROM THE NORMAL NOT DUE TO EXISTING DISEASE.

1. The thorax may be *small* and *contracted* in its capacity, this condition being either congenital or acquired. Two forms of small chest are met with, viz. :—*a*. That in which the ribs are very oblique and the intercostal spaces wide; the chest is long, and narrow in all its diameters; the costal angles are very acute; while the scapulæ are often tilted up behind, so as to resemble wings, this form of chest having on this account being termed *alar* or *winged*. *b*. That in which the front of the chest is flattened, so that the antero-posterior diameter is very small.

2. Some important *deformities* of the chest are originated during the period of infancy and childhood, in consequence of an insufficient amount of air entering the lungs during the act of breathing. This may be due either to some obstruction in the air-passages; to a weak condition of the muscles which expand the chest; or to both these causes combined: and the deformities are more liable to occur in proportion to the yielding nature of the thoracic walls. When these conditions exist, sufficient air does not reach the lungs during inspiration to enable them to fill up the vacuum produced by the descent of the diaphragm, and hence the chest is driven in to a greater or less degree by external atmospheric pressure, being also partly drawn in by the action of the diaphragm and possibly of other muscles. The chief diseases originating the obstruction which leads to deformity of the chest are bronchitis; hooping-cough; laryngismus stridulus; croup; and chronic enlargement of the tonsils.

Four special deformities of the chest have to be described, namely:—

a. *Transversely-constricted*. This is a very frequent deviation from the normal, the lower part of the chest presenting in front a more or less deep groove or depression, passing obliquely outwards and downwards from the ensiform cartilage.

b. *Pigeon-breast*. Here there is a falling-in of the true ribs on each side, so that they become more or less straight in front of their angles, while the sternum is or seems to be projected forwards. Hence a transverse section of the chest is triangular, with the base behind and the apex in front. The ensiform cartilage is also frequently bent sharply backwards at its junction with the sternum, where there is consequently an angular ridge or prominence. More or less transverse constriction is always observed in the pigeon-breast.

c. *Anteriorly-depressed*. Occasionally the part of the sternum below the third cartilages is considerably depressed, so as to present a concavity of variable depth, carrying with it the contiguous portions of the rib-cartilages. In some instances this deformity is congenital, but this is by no means always the case.

d. *Rickety*. The true rickety thorax is very characteristic. It is more or less flattened posteriorly as far as the angles of the ribs, where there is a marked bend; on each side a groove, varying in breadth and depth, runs obliquely downwards and outwards, which may extend from the first to the ninth or tenth ribs, but is most marked about opposite the fifth, sixth, and seventh; this corresponds mainly to the line of junction of the ribs with their cartilages, which is indicated by a series of nodular swellings, but the bottom of the groove is formed more by the ribs than the cartilages. In front of this groove the cartilages are more or less curved, and the sternum is somewhat prominent, so that the antero-posterior diameter is increased. The greatest lateral diameter is opposite the angle of junction between the dorsal and lateral regions; and the shortest corresponds with the bottom of the lateral depressions. The solid organs underneath will influence the form of the rickety chest.

3. The thorax may be deformed as the result of occupation; of the pressure of stays or belts; or of previous injury to, or disease of, the ribs or spinal column.

B. CHANGES IN SHAPE AND SIZE DUE TO EXISTING DISEASE.

1. *General enlargement.* In this condition the chest is more or less expanded, approaching to the form and size which it presents after a deep inspiration, or even going beyond this, so as to become "barrel-shaped." The enlargement may involve the whole length of the thorax, or only its upper part. *Causes. a.* Emphysema usually. *b.* Extreme double pleuritic effusion very rarely.

2. *General diminution.* This is the opposite of enlargement, and the thorax may assume either the alar or flattened form. It may result from phthisis, but the two sides are rarely contracted to an equal extent, while local depressions are usually observed in this disease.

3. *Unilateral enlargement.* An enlarged side is usually more rounded than the opposite one, and appears to be short, having a long antero-posterior diameter, and a large costal angle. The corresponding shoulder is raised; and the spine tends to be curved towards the opposite side. *Causes. a. Conditions of the pleura.* (i.) Pleuritic effusion in the great majority of cases. (ii.) Occasionally pneumothorax or hydro-pneumothorax. (iii.) Very rarely hæmothorax. *b. Conditions of the lung.* (i.) Hypertrophy or distension of one lung. (ii.) Secondary cancer.

4. *Unilateral diminution* or *Retraction.* The characters are the reverse of those observed in enlargement, the entire side being small and cramped, while the ribs are aggregated together to a variable degree. *Causes. a.* In most instances pleuritic adhesions, binding down the lung so that it cannot expand. In all cases of retracted side pleuritic adhesions are formed after a while. *b.* Collapse of the lung from any cause. *c.* Changes in the lung-structure diminishing its volume and power of expansion, namely:—phthisis; chronic or interstitial pneumonia; primary cancer.

5. *Local enlargement* or *Bulging.* This alteration necessarily varies much in its site, extent, and form, and careful measurement may be

required in order to determine it accurately. *Causes.* The most frequent and important causes of bulging of the chest are enlargement of the heart; pericardial effusion; and aneurism of one of the great vessels. The remaining causes, which are very uncommon, include:—*a. Conditions of the pleura.* (i.) Empyæma pointing on the surface. (ii.) Localized pleuritic effusion. (iii.) Localized pneumothorax. *b. Conditions of the lung.* (i.) Pneumonia at the base or apex. (ii.) A large phthisical cavity at the apex. (iii.) Localized emphysema. (iv.) Very rarely a hernial protrusion. *c.* Mediastinal tumours or enlarged glands. *d.* Enlargements of the liver or spleen. *e.* Disease of the sternum or ribs, or of their investing periosteum. *f.* Superficial abscesses and growths.

6. *Local diminution* or *Depression.* *Causes.* (i.) Phthisis, the depression being due to the local changes in the lung and the accompanying pleurisy, and especially affecting the supra- and infra-clavicular regions. (ii.) Localized pleuritic adhesions.

7. The *costal angles* and *intercostal spaces* are often altered in size; and the latter are frequently abnormally bulged or depressed, as the result of morbid conditions of the pleura. Anything that affects the size of the chest, either generally or unilaterally, will necessarily influence that of the costal angle and intercostal spaces; while the latter will also be altered locally along with any local bulging or depression.

II. MOVEMENTS OF RESPIRATION.

The respiratory movements are investigated by *inspection, palpation,* and *mensuration.* When examining for disease, it is necessary to observe these movements during ordinary and forced respiration.

The following facts bearing upon the physiology of these movements must be borne in mind:—1.—They are partly *costal* or *thoracic;* partly *diaphragmatic* or *abdominal.* The thoracic movements are made up during inspiration of *elevation* and *expansion;* during expiration of *depression* and *retraction.* 2. In health there is no obvious difference in the movements of the two sides. 3. In males and children the diaphragm and lower ribs chiefly act during ordinary breathing, the movements being mainly abdominal; while in females the upper part of the chest moves most, and breathing is upper costal. During forced respiration the movements are chiefly upper costal in all individuals. 4. The ordinary number of respirations ranges from 16 to 20 per minute. 5. Expiration is slightly longer than inspiration, the ratio being about 12 to 10 in males, 14 to 10 in females. 6. The inter-costal spaces in most parts become rather more hollow during inspiration; as well as the supraclavicular fossæ. This is especially noted when a deep breath is drawn, and the sinking of the spaces is best observed towards the lower and lateral part of the chest. 7. Inspiration is entirely effected by muscular action; expiration chiefly by the elasticity of the lungs and chest-walls, aided somewhat by muscular force, which is called into play to a much greater degree during forced expiration.

ABNORMAL RESPIRATORY MOVEMENTS.

The deviations from the normal which the respiratory movements present may be arranged in the following manner:—

A. ALTERATIONS AFFECTING THE GENERAL MOVEMENTS.

1. *Alterations in frequency.* The respirations may be counted either by watching the movements; or by applying the hand over the epigastrium. Their frequency may be:—(i.) *Increased. Causes. a.* Most conditions which interfere with the action of the lungs in any way, and which give rise to any form of dyspnœa. *b.* Many cardiac affections. *c.* Certain nervous disorders, such as hysteria. *d.* An unhealthy state of the blood, for example, that present in anæmia or fevers. (ii.) *Diminished.* A slow rate of breathing is often noticed in apoplexy, narcotic poisoning, and some nervous derangements, *e.g.*, trance.

2. *General movements in excess.* The patient breathes deeply and with unusual force, the extraordinary muscles being brought into play; the range of movement is greater; and more air is changed during each respiration. *Causes. a.* Anything that interferes with the functions of the lower part of the lungs, such as disease in these organs themselves, *e.g.*, pneumonia, congestion, œdema, bronchitis; accumulations in the pleuræ; or abdominal enlargements (ascites, enlarged liver). *b.* Cardiac diseases which impede the circulation of the blood, and hence interfere with its proper aëration. *c.* Certain abnormal conditions of the blood itself, such as anæmia.

3. *General movements deficient.* This deviation may be associated either with increased, normal, or diminished frequency. *Causes. a.* Anything that extensively obstructs the functions of the lungs, *e.g.*, capillary bronchitis, double pneumonia, or effusion into both pleuræ. *b.* Painful chest-affections, *e.g.*, acute pleurisy or pneumonia, pleurodynia, intercostal neuralgia. *c.* Rarely interference with the action of the respiratory muscles from spasm or paralysis. *d.* Certain conditions of the central nervous system, *e.g.*, narcotic poisoning and trance. *e.* Very rarely infiltration of the chest-walls with cancer.

4. *Altered relation between the thoracic and abdominal movements.* (i.) *Thoracic movements in excess, from diminished action of the diaphragm. Causes. a.* Usually some accumulation in the abdomen, mechanically interfering with the descent of the diaphragm, such as ascites, flatus, or a large tumour. *b.* Conditions which render movement of the diaphragm or abdominal walls painful, especially peritonitis, but also diaphragmatic pleurisy, muscular rheumatism, and inflammation of the diaphragm or abdominal walls. *c.* Extreme pericardial effusion. *d.* Paralysis of the diaphragm from any cause. (ii.) *Diaphragmatic and abdominal movements in excess. Causes. a.* Any condition which is attended with pain on bringing the chest-walls into play, *e.g.*, pleurisy, pleurodynia. *b.* Paralysis or spasm of the chest muscles. *c.* Obstruction in connection with the air-passages, preventing the entrance of a sufficient amount of air.

5. *Alteration in the ratio between the expansion- and elevation-movements of the ribs.* The only important deviation in this respect is a diminution in the expansion-movement, which may amount to its complete absence. It is especially observed during forced breathing, when there may appear to be considerable movement of the chest, but none of the expansile kind. *Causes.* *a.* General emphysema, the lungs being already distended, and the chest expanded to a greater or less extent. *b.* Rigidity of the chest-walls. *c.* Anything within or external to the lungs which either prevents them from acting, or interferes with the entrance of air, *e.g.*, pulmonary consolidations, pleuritic accumulations or adhesions, or pressure on the air-tubes.

6. *Alterations in the rhythm of the respiratory act.* Unequal or *jerky* breathing is often noticed in certain nervous disorders, such as chorea and hysteria. The most important change in rhythm, however, is that in which the *relative length of inspiration and expiration becomes disturbed,* the former being more or less short and quick; and the latter prolonged, slowly performed, and often laboured- *expiratory dyspnœa.* *Causes.* *a.* Diminution in the elasticity of the lung-tissue and chest-walls, which is particularly observed in emphysema with rigid chest. Expiration becomes then either entirely a muscular act; or far more so than in the normal condition. *b.* Some obstruction to the escape of air through the principal air-passages; or narrowing of a large number of bronchi.

7. *Depression of the chest-walls.—Inspiratory dyspnœa.* Instead of expanding during inspiration, the chest may fall in to a greater or less extent, especially at its lower part, producing either temporarily or permanently one of the forms of deformed thorax already described. This deviation is chiefly observed in children. *Causes.* *a.* Almost invariably some obstruction to the entrance of air into the lungs. The conditions to which such obstruction is mainly due, are;—(i.) Bronchitis. (ii.) Hooping-cough. (iii.) Anything tending to occlude the larynx or trachea, *e.g.*, croup, œdema glottidis, laryngismus stridulus, pressure of a tumour or aneurism. (iv.) Enlarged tonsils or other impediment about the pharynx. *b.* Occasionally, it is said, very rapid œdema of the lung, or hydrothorax.

B. ALTERATIONS AFFECTING UNILATERAL MOVEMENTS.

1. *Inequality of the respiratory movements on opposite sides.* This is usually due to *deficient or complete want of expansion* on one side. *Causes.* *a.* Some accumulation in one of the pleural cavities, or adhesions binding down the lung, and preventing its expansion more or less. *b.* Changes in the lung-tissue on one side, interfering with its inflation, *e.g.*, acute or chronic pneumonia, phthisis, cancer. *c.* Pressure on either chief bronchus by a tumour, or obstruction of its canal, air being thus prevented from passing into the lung. *d.* Painful affections of one side. *e.* Unilateral paralysis of the muscles rarely. When the movements of one side are interfered with, those of the opposite side frequently become ex-

cessive, owing to the corresponding lung having to perform extra work.

2. *Altered relation of the abdominal to the thoracic movements on one side.* This is certainly observed occasionally, but it is not of much consequence.

3. *Unilateral inspiratory dyspnœa.* The chest-wall may fall in on one side during inspiration, owing to obstruction of a main bronchus.

C. Local changes in movement.

1. The common deviation met with is a *local deficiency*, in which both expansion and elevation are involved, but especially the former. The usual causes of this change are phthisis; and localized pleuritic adhesions.

2. Occasionally a *limited falling-in* during inspiration is observed, due to obstruction of one of the smaller bronchial divisions.

D. Abnormal movements of the intercostal spaces.

In pleuritic effusion, pneumonia, and other conditions which affect the movements of the chest, the intercostal spaces frequently do not exhibit their usual changes of form during the act of breathing, and in some instances of extreme pleuritic effusion an undulatory motion is perceptible. They are often quite motionless over the seat of local deficiency in movement.

III. Examination of various kinds of Fremitus.

A. Vocal and Cry-fremitus. Vocal fremitus is investigated by applying the hand to the surface while the patient repeats the words "ninety-nine," or counts from one to ten. As already remarked, the cry answers the same purpose in children. The normal variations due to the quality of the voice; age and sex of the individual; state of the chest-walls; and the part of the chest over which the examination is made, must be borne in mind. As a rule vocal fremitus is more marked on the right than on the left side, especially over the upper part of the chest in front.

The changes which may be observed in disease are:—

1. *Changes in area.* This may be—(i.) *Increased,* in distension of the lungs from emphysema or hypertrophy. (ii.) *Diminished,* when the lung is retracted by adhesions; or pushed aside by some solid mass, such as an enlarged heart.

2. *Changes in intensity.* (i.) *Increased. Causes. a.* Consolidation of the lung from any cause, provided that the consolidating material is not too abundant, or too hard or pulpy; and that it encloses tubes containing air. Vocal fremitus is especially marked if at the same time the bronchial tubes are dilated; or if cavities of certain characters exist in the lungs. Hence increased vocal fremitus is an important sign of pneumonia, phthisis, chronic pneumonia with dilated bronchi, some cases of cancer, and similar conditions. *b.* Condensation of the lung from compression or collapse. *c.* Bron-

chitis, congestion or œdema of the lungs, and pulmonary apoplexy, but the fremitus is by no means constantly increased in these affections, and is of little importance. (ii.) *Diminished* or *suppressed*. *Causes*. *a*. Separation of the lung from the chest-wall by some intervening imperfectly-conducting material, *e.g.*, fluid or air in a pleural cavity; or enlarged organs or morbid growths invading upon the cavity of the thorax. *b*. Very extensive, as well as dense or pulpy consolidation of the lungs, with obliteration of the tubes, so that no air can enter, *e.g.*, extensive soft cancer, certain cases of phthisis, and pneumonia with rapid and abundant exudation. *c*. Distension of the lungs in emphysema.

These alterations in the intensity of the vocal fremitus may be observed over a very limited region, or over a considerable part of the chest. It is at the base and apex of the lungs that they are chiefly important, especially in distinguishing between fluid effusion and pneumonic consolidation at the base, and aiding in detecting phthisical consolidation at the apex. Increase and deficiency may be noticed in different parts of the thorax on the same side; *e.g.*, in cases of pleuritic effusion the fremitus is often absent below, but in excess above, on account of the compressed state of the lung.

B. TUSSIVE FREMITUS.—This is affected in much the same way as vocal fremitus, but it is of little importance, except when the voice is very weak, and hence cannot be made use of.

C. RHONCHAL FREMITUS.—Due to the passage of air through bronchial tubes containing thick mucus or some fluid, rhonchal fremitus becomes an important sign of bronchitis or œdema, especially in the case of young children.

D. PLEURITIC FRICTION FREMITUS.—Not often met with, this fremitus indicates the presence of much firm material in connection with the pleura. It is most frequently observed during the later stages of acute pleurisy; but may be very marked in cases of chronic dry pleurisy.

IV. PHYSICAL SIGNS OBTAINED BY PERCUSSION.

A. PERCUSSION-SOUNDS.

SOUNDS IN HEALTH.—Five distinct sounds may be obtained by percussion in a healthy subject, which differ in their degree of resonance, length, fulness, pitch, and clearness.

1. *Tympanitic* or *Drum-like*. In this country the term *tympanitic* is applied to the sound which is elicited by percussing over the abdomen, being dependent upon accumulation of gas within the stomach and intestines. It has considerable resonance; is of prolonged duration, low in pitch, and full; being either more or less muffled or clear, according to the degree of distension.

2. *Pulmonary* or *Sub-tympanitic*. This is the sound brought out by percussing over healthy lung-tissue, and which is therefore elicited over the greater part of the chest. Possessing a fair amount of resonance, it is shorter, less full, and higher-pitched than the tym

panitic sound, and ordinarily is muffled. It has been likened to the sound elicited by striking over a "muffled drum."

2. *Laryngeal, Tracheal*, or *Tubular*. As the names indicate, this sound is produced over the main wind-pipe. Much less resonant than those already described, it is also considerably shorter and of higher pitch, and has a tubular quality; as a rule it is not clear, on account of the structures which cover the air-tube.

4. *Bony* or *Osteal*. It is not always possible to obtain the osteal sound distinctly over the healthy chest, but it imparts its characters to other sounds, especially over the sternum and clavicles. It can be observed over any of the bony prominences of the body. With hardly any resonance, this sound is very short, high-pitched, and tolerably clear.

5. *Dull* or *Non-resonant*. When percussion is made over solid organs and other structures, the sound elicited is more or less dull, short, and abrupt; it is supposed that each organ gives rise to a peculiar pitch of its own, but certainly few are able to appreciate this difference.

CHANGES AFFECTING THE PERCUSSION-SOUNDS.

When percussing the chest with the view of obtaining evidence of disease by the aid of the sounds elicited, the points to be noticed are:—1. Whether there is any actual change in the characters of the sound elicited, either over the chest as a whole, or over any part of it. 2. If there is any increase or diminution in the extent over which the normal pulmonary sound is heard. 3. Whether the proper difference is noticed between the sounds produced after a full inspiration and after a deep expiration respectively, either generally or locally, both as regards characters and area. 4. If superficial and deep percussion yield different results.

(A). CHANGES IN THE CHARACTERS OF THE PULMONARY SOUND.—1. *The percussion-sound may become hyper-resonant or actually tympanitic.—Causes.* (i.) Pneumothorax, provided the amount of air in the pleura is not so great as to stretch the chest-walls very immoderately, when it is found that the sound becomes muffled or dull. (ii.) Certain states of the lungs, in which they contain excess of air in proportion to the solid tissues, this being often combined with more or less distension of the air-vesicles, viz., emphysema, hypertrophy, atrophy, extreme bloodlessness. In these conditions the sound is too resonant, but rarely actually tympanitic.

2. Without any marked alteration in quality, *the pulmonary percussion-sound may become unusually clear, e.g.*, in some cases of bronchitis, congestion, œdema of the lungs, or the early period of pneumonia. This is due to "liquid or solid being mixed intimately with air-containing tissues," and the sound under these conditions may even assume a tubular quality.

3. *Resonance may be more or less diminished, to absolute dulness.* When this deviation exists, it is necessary to note the degree of the change, which may vary from a slight deficiency in resonance to the most complete dulness; its situation and extent; the pitch of

the sound elicited; the form of the dulness; and, in some cases, whether alteration in posture has any effect upon it. There are two dull percussion-sounds which call for special mention:—1. The *hard wooden* sound, which is very short and abrupt; almost non-resonant; exceedingly high-pitched; and accompanied with a sensation of much resistance. 2. The *putty-like* sound, this being, as its name suggests, an absolutely non-resonant, dull, heavy, and dead sound. *Causes.* It may be useful to enumerate all the causes which are capable of giving rise to abnormal dulness in various parts of the chest. They include.—(i.) Certain affections of the chest-walls, such as infiltrated cancer, diseased or inflamed bone and its consequences, periostitis. (ii.) Accumulations in the pleural sac, of serum, pus, or blood; or its extreme distension with air. (iii.) Consolidation of the lungs, *e.g.*, pneumonia, phthisis, thickening and dilatation of the bronchi, cancer. (iv.) Excessive collection of fluid in the bronchi, air-vesicles, or lung-tissues, as in extensive bronchitis, congestion, or œdema; or a local collection of fluid, such as an abscess or hydatid cyst. (v.) Considerable collapse or compression of the lungs; or, on the other hand, extreme distension of these organs. (vi.) Enlargements in connection with the heart; or solid or fluid accumulations in the pericardium. (vii.) Mediastinal enlargements of all kinds, such as various tumours, enlarged glands, abscess, aneurism. (viii.) Enlarged or displaced abdominal organs, especially the liver or spleen; or, rarely, tumours extending upwards from the abdomen.

4. *Peculiar sounds. a. Tubular.* This sound is not uncommonly met with in some part of the chest, but never over any great extent. It resembles that produced over the trachea, varying somewhat in its pitch, and usually being quite clear. *Causes.* (i.) Cavities in the lungs, not too large, either superficial, or having some firm, well-conducting tissue between them and the chest-walls, and containing little or no fluid. Such cavities are generally associated with phthisis, but may be due to enlarged bronchi. (ii.) The presence of some solid mass in the chest, not of too large a size, and intervening between the trachea or one of the main bronchi and the surface, forming a well-conducting medium, *e.g.*, any mediastinal tumour, but especially enlarged glands in the posterior mediastinum, the tubular sound being then heard in the interscapular region, particularly in children. (iii.) Certain conditions in which the lower part of the chest is invaded upon, so that the lung is pushed or floated upwards, when it is partially in a relaxed, partly in a condensed condition; a tubular sound may then be perceptible under the clavicle. This is often observed in cases of pleuritic effusion; and occasionally in connection with tumours in the chest or enlarged abdominal organs, or consolidation of the lung itself, *e.g.*, basic pneumonia.

b. Amphoric. This is a peculiar resonant sound of very rare occurrence, having a markedly hollow and metallic character. *Causes.* (i.) A very large phthisical cavity in the lungs, situated near the surface; usually with adherent pleura; having smooth, thin, but firm walls; and containing chiefly air, with but little fluid. (ii.) Pneumothorax occasionally.

c. Metallic. This is a high-pitched sound, of distinctly metallic quality, not unfrequently tinkling or splashing. It is not always easy to distinguish it from the *crack-pot* sound, and both may be elicited in the same case, according to the force used in percussion, as they depend upon similar physical conditions, viz., a cavity containing air.

b. Crack-pot or *cracked-metal sound.*—"*Bruit de pot felè.*" Also of metallic quality, this has in addition a cracked character, as its name indicates, and gives the impression of air being driven out through a chink or small aperture. It may be imitated somewhat by clasping the hands loosely together, and striking the back of either of them over the knee, so as to drive out the enclosed air. *Causes.* In the chest the crack-pot sound is caused by air enclosed between two surfaces, the anterior of which is yielding, being suddenly expelled through an orifice, and it may be met with under the following conditions:—(i.) It is most important as a sign of a cavity in the lung, which must be of good size, tolerably superficial, containing air, having one or more bronchi opening into it, and its front wall being more or less yielding. These conditions are best fulfilled by phthisical cavities at the apices of the lungs, and hence the sign is most commonly observed in one or other infraclavicular region. In order to elicit the sound, the patient should open his mouth and turn towards the operator, and percussion must be made firmly but rapidly and abruptly, during the act of expiration. (ii.) In children affected with bronchitis, or even when very young infants merely cry, a sound resembling a crack-pot sound may be brought out in many parts of the chest, but there ought to be no difficulty in distinguishing this from that due to a cavity. It must be mentioned, however, that a similar sound may occasionally be elicited in subjects 10 or 12 years old, who have very soft and yielding chest-walls. (iii.) In rare instances this sign is observed over the front of the chest in cases of pleuritic effusion, or of consolidation of the posterior part of a lung.

(B). CHANGES IN THE EXTENT OF PULMONARY RESONANCE.—The area of pulmonary resonance may be:—1. *Increased,* when the lungs are distended with air, especially from emphysema, but also as the result of hypertrophy, or of temporary inflation. 2. *Diminished.* It is not easy to separate this deviation from dulness, still it not unfrequently affords an important sign of a lung being contracted within its usual limits.

(C). EFFECTS OF INSPIRATION AND EXPIRATION UPON THE PERCUSSION-SOUND.—1. *There may be no extension in area, or increase in amount of resonance, after a full inspiration, either generally or on one side; and no diminution in the same after a deep expiration.* *Causes.* (i.) Extreme distension with loss of elasticity of the lungs, as in emphysema. (ii.) Some obstruction to the passage of air through the air-tubes, *e.g.*, bronchitis, spasmodic asthma. (iii.) Interference with the expansion of the lung, either from external pressure, such as that of pleuritic effusion or adhesions; or from extensive disease in the

organ itself. This only affects the results of inspiration. (iv.) Air in the pleural cavity, which cannot be increased or diminished in quantity.

2. In cases of suspected consolidation at the apex of a lung, where the signs are not marked, it is very important to notice whether there is a proper difference in the percussion-sounds after a deep inspiration and a forced expiration respectively, as regards amount and area of resonance, and alteration in pitch.

(D). DIFFERENCE BETWEEN SUPERFICIAL AND DEEP PERCUSSION.—This may be of much use in determining the precise physical conditions present in a phthisical lung. For instance, superficial percussion may give rise to hard dulness, showing the presence of much consolidation; while on deep percussion a crack-pot sound may be elicited, indicating the existence of a cavity within the consolidation.

B. SENSE OF RESISTANCE OR ELASTICITY.

During the act of percussion the sensation which is conveyed to the fingers should always be noted. The information thus obtained is mainly useful:—1. In making out the state of the chest-walls as to the degree of rigidity, elasticity, distension by air, and other conditions. 2. In distinguishing between dulness due to fluid or to some solid material. 3. In determining the amount and actual density of any solid accumulation.

V. PHYSICAL SIGNS OBTAINED BY AUSCULTATION.

A. RESPIRATORY-SOUNDS.

SOUNDS IN HEALTH.—In health three typical sounds may be heard during the act of breathing, on listening over different parts of the respiratory apparatus.

1. *Tracheal* or *Laryngeal.* Heard on applying the stethoscope immediately over the windpipe in the front of the neck, this sound has the following characters.—It is very loud, hollow, and high-pitched; begins simultaneously with the act of inspiration, and continues of the same intensity throughout; presents a marked interval between its inspiratory and expiratory portions; and the latter is not only well heard, but is rather the longer, louder, and higher-pitched. This sound is laryngeal in its origin.

2. *Bronchial.* This differs from the former in the following particulars:—It is not at all hollow, nor is it so loud or high-pitched; has a harsh quality; is not quite so rapidly evolved; does not present such a distinct interval between inspiration and expiration; and the latter is shorter than in the tracheal sound. Bronchial breathing may be heard normally in some individuals in the interscapular regions; as well as over the upper part of the sternum and contiguous end of the clavicles. This sound is laryngeal in origin, modified by conduction along the larger bronchi.

3. *Pulmonary* or *Vesicular.* On listening over the greater part of the chest, a soft, breezy sound is heard during inspiration, which is gradually developed but continuous; no interval can be observed between it and the expiratory sound; and the latter, when present, is very much shorter and more feeble than the inspiratory sound, though rather harsher and lower pitched, but not infrequently it is quite inaudible. Some authorities maintain that the pulmonary sound is actually originated in the air-vesicles; others that it is either entirely or in part the laryngeal sound conducted and modified.

Several conditions influence the breath-sounds in health, but only *age* and *sex* can be here alluded to. In children they are very loud, and expiration is prolonged, this breathing being termed *puerile.* In aged persons the sounds are weak, but expiration is usually lengthened. In females they are usually loud, and often of a jerky character.

CHANGES IN THE BREATH-SOUNDS OVER THE CHEST DUE TO DISEASE.

(A). CHANGES IN INTENSITY.—1. *The breath-sounds may be weakened in various degrees, or completely suppressed, either over a limited region; over one side; or over the greater part or whole of the chest. In some conditions they seem to be deep and distant. Causes. a.* Anything interfering with the entrance of air through the air-passages into the lungs, whether due to spasmodic or other constriction, internal obstruction, or external pressure. *b.* Imperfect respiratory movements, on account of pain, paralysis or spasm of the muscles, or any other cause. *c.* Permanent distension of the lungs, so that little or no air can enter into them, as in emphysema. *d.* Any condition which, by pressing upon the lungs, prevents them from expanding, or which interferes with the transmission of sound, *e.g.*, pleuritic accumulations of all kinds, extensive adhesions, abdominal enlargements invading upon the chest, or intra-thoracic tumours. *e.* Very extensive or very dense consolidation of the lungs, *e.g.*, extensive cancer, and certain cases of phthisical or pneumonic consolidation. *f.* Conditions in which the respiratory sounds are obscured by râles, *e.g.*, capillary bronchitis or pulmonary œdema.

2. *The respiratory sounds may be puerile, being increased in intensity, the expiratory portion becoming then unusually distinct. Causes. a.* If one lung, or any portion of one or both lungs, is called upon to do extra work, in consequence of interference with the functions of the other lung or parts, the respiratory sounds become puerile over the corresponding regions. This is observed, for instance, in cases of pleuritic effusion or adhesions, consolidation of parts of the lungs, or obstruction of a bronchus. *b.* When a bronchus is suddenly relieved of spasm, the breathing becomes exaggerated over the portion of lung to which its ramifications pass.

(B). CHANGES IN RHYTHM.—Many deviations in rhythm are described, but only two can be readily appreciated, so as to be practically useful.

1. *The breath-sounds may become more or less jerky or wavy, so as sometimes to have a cogged-wheel rhythm, especially the inspiratory sound.* This is by no means a reliable sign of disease, especially in females, in whom it is often met with if they are at all nervous or hysterical, while it frequently depends upon excited cardiac action. *Causes.* Jerky breathing may be observed:—*a.* In painful affections of the chest, such as early pleurisy or pleurodynia, when the patient often breathes in a jerky manner. *b.* In the early stage of phthisis. *c.* In connection with pleuritic adhesions.

2. *The most important change in rhythm is a prolongation of the expiratory sound, so that it may become twice or even three or four times the length of that of inspiration, which often becomes actually shortened.* Prolonged expiration generally attends certain alterations in the breath-sounds to be immediately noticed, but it may be the main or the only alteration observed. *Causes. a.* Emphysema, the elasticity of the lungs being more or less diminished. *b.* Obstruction to the exit of air through the respiratory passages.

(C). CHANGE IN THE EXTENT OVER WHICH THE BREATH-SOUNDS ARE HEARD.—This may be:—1. *Increased,* from distension of the lungs. 2. *Diminished,* owing to their retraction.

(D). CHANGES IN QUALITY, ALONG WITH OTHER CHARACTERS.—Some very important abnormal breath-sounds are met with, which differ entirely from those ordinarily heard over the chest, in their quality, pitch, rhythm, and other particulars.

1. *Harsh* or *rough breathing.* As its name indicates, this merely implies a harshness of the sound, its soft, breezy character being wanting, which is specially marked during expiration, this portion being unduly lengthened. Harsh breathing is not very reliable as evidence of disease, but is frequently observed in connection with slight consolidations, bronchial catarrh, the early period of pneumonia, and various other morbid conditions.

2. *Bronchial.* In its characters this corresponds with the normal sound thus named, but it is heard in unusual regions, or is unusually marked. *Causes. a.* Consolidation of the lung-tissue, if moderate in amount and contiguous to the surface, *e.g.*, in phthisis, cancer, chronic pneumonia, and in some cases of acute pneumonia. Even when the lungs enclose small cavities or dilated bronchi, the breathing is often merely of a bronchial character. *b.* Condensation of the lung.

3. *Blowing.* Though approaching on the one hand to bronchial breathing, and on the other to tubular, this sound has sufficiently distinctive characters to merit recognition. It differs from the former in its markedly "blowing" quality, being much clearer and higher-pitched; from the latter in being diffused, and not hollow, or as if originated in a localized tube. *Causes. a.* Diffused pulmonary consolidation, not too abundant, especially in certain parts, *e.g.*, phthisis, pneumonia. *b.* Small cavities or dilated bronchi surrounded by solid material. *c.* Occasionally conduction of the sound from a large bronchus to the surface by a solid medium.

4. *Tubular.*—A high-pitched, concentrated, somewhat hollow and metallic sound, this much resembles the normal tubular breathing

heard over the trachea, and gives the impression of being directly conveyed from a tube. *Causes.* *a.* Acute pneumonia, in which disease it is often of the most typical kind. *b.* Certain cavities in the lungs. *c.* A solid mass of moderate size intervening between the trachea or a main bronchus and the chest-wall, so as merely to form a medium of communication between them.

5. *Cavernous.*—This is a clear and distinctly hollow sound, varying in its pitch, which tends to be low, especially during expiration. It is usually only perceived over a limited area, and strikes the ear as being produced in a hollow space, its exact characters varying according to the dimensions and other characters of this space. *Causes.* *a.* A cavity in the lung, of some size, tolerably superficial, and not containing much fluid. *b.* In rare instances, it is said, consolidation around an ordinary-sized bronchus.

6. *Amphoric.*—A still more hollow sound, and of peculiar metallic quality, amphoric breathing resembles the sound heard on blowing into a large empty glass bottle or metallic vessel. *Causes.* For its production it is necessary to have an extensive empty cavity, with firm and smooth walls, into which air enters more or less freely. These conditions are found in :—*a.* Pneumothorax most frequently, air entering the pleura through a communication opening from the lung. *b.* Phthisical excavation in the lung very rarely, having one or more bronchi communicating with it.

The morbid sounds just described may be heard in different parts of the same chest; or they may be observed in succession over the same region as the physical conditions change, there being no marked boundary-line between them, but a gradual transition from one to another. For instance, in phthisis the breathing, which is at first harsh or bronchial, may become blowing, especially in certain regions, and then in succession tubular, cavernous, or even amphoric, as cavities form and increase in size. The hollow sounds, though usually present during inspiration and expiration, may only be heard during the former act. A deep breath usually causes them to become much louder; and frequently a sharp cough enables them to be heard where they did not exist before, owing to the displacement of some obstructing secretion, or the discharge of fluid from a cavity. These sounds may appear to be superficial and strong; or more or less deep and feeble. Care must be taken not to mistake a conducted pharyngeal sound for cavernous respiration.

7. In exceptional instances *peculiar respiratory sounds* are met with. In connection with some cavities they may have a *sucking* or *hissing* character. Sometimes the air appears to be drawn away during inspiration, and puffed back during expiration; this is termed the *souffle* or *veiled puff.*

B. RÂLES OR RHONCHI.

These terms are applied to certain adventitious sounds which are originated within the lungs or the air-tubes. Before proceeding to their consideration, it is necessary to mention that they may be simulated by sounds induced by the act of breathing, and resulting from contraction of the muscles of the chest-walls; subcutaneous œdema or emphysema; hairs on the surface of the thorax; fluid in the mediastinal cellular tissue; or the opening up of healthy lung-tissue during a deep inspiration.

Râles or rhonchi are generally produced by the passage of air during the act of breathing:—(i.) Through bronchial tubes narrowed by thickening of the mucous membrane; by various deposits upon its surface, such as thick secretion or exudation; by organic changes in their walls; or by spasm of the muscular fibres. (ii.) Through fluids of variable consistence, contained in normal or enlarged air-tubes or vesicles. (iii.) Through fluid contained in cavities in the lungs. (iv.) Through substances originally solid, which are undergoing a process of softening. (v.) Into air-vesicles, either of normal size or enlarged, the walls of which are collapsed or stuck together, thus causing them to open up. In rare instances the action of the heart originates rhonchal sounds, when there is much fluid in contiguous tubes or cavities.

The following points must be noticed with regard to these adventitious sounds:—1. Their characters, viz., whether dry or liquid; large or small; peculiar quality, such as musical, crackling, bubbling, gurgling, whistling, &c.; pitch; whether at all hollow or metallic, and the degree in which this character is present. 2. If they are heard both during inspiration or expiration, or only during one of these acts. 3. Their situation and extent. 4. Their amount. 5. Whether they are constant or only heard at intervals; and if they are affected by a full inspiration or cough.

CLASSIFICATION AND SPECIAL CAUSES OF RÂLES OR RHONCHI.

So many different classifications of râles or rhonchi have been invented, and such confusion has prevailed with regard to the meaning of the various terms employed, that it is by no means easy to fix upon any classification. I have, however, adopted the following:—

(A). VIBRATORY or DRY MUSICAL RHONCHI.—These sounds are produced by air traversing air-tubes narrowed in some of the ways mentioned above. They vary in their precise characters according to the size of the tube affected, and the immediate cause of the narrowing. They are grouped as follows:—1. *Sonorous.* This is a deep-toned, low-pitched sound, varying much in its exact quality, which may be snoring, growling, humming, cooing, &c.; it appears to be superficial, is often extensively heard, and generally accompanies both inspiration and expiration, but may be limited to either act, especially the latter. 2. *Sibilant.* This is of much higher pitch, often whistling, hissing, or musical; is not so extensively heard as the sonorous rhonchus; and as a rule accompanies both inspiration and expiration. Both these classes of rhonchi are liable to much irregularity, disappearing from time to time, especially after a cough, and they often occur together. *Causes. a.* Bronchitis, especially chronic, but also the acute form in its

early stage, and the plastic variety. *b.* Spasmodic contraction of the bronchial tubes in cases of asthma.

(B). CREPITANT RÂLES.—1. *True crepitant râle.* This is a sound only met with in the early stage of acute pneumonia, and is therefore observed usually towards the base of one lung, but may be heard over any part of the organ which is the seat of the inflammatory process. It consists of a great number of extremely minute, sharp, crepitant or crackling sounds; equal in size; perfectly dry; heard in short puffs during inspiration alone in most cases, and often only towards its termination; and increased in amount by a deep breath. It has been aptly compared to the sound produced by rubbing a lock of hair firmly between the finger and thumb close to the ear; or to the burning of salt in the fire. The theories as to the production of the *true crepitant râle* are, that it is due to the opening up of air-vesicles stuck together, which is the most probable; to air passing through thick exudation; or to minute lacerations of lung-tissue. 2. *Redux crepitant râle.* Heard in the advanced stage of acute pneumonia, when resolution is taking place, this differs from the former in that the crepiti are much less abundant; larger and of unequal size; less dry; and perceived during both inspiration and expiration. It gives the impression of air passing though a thick material, which is the pneumonic exudation undergoing a process of softening. A sound of similar characters is sometimes noticed in phthisis. 3. *A large dry crepitant râle* is said to be observed in some cases of emphysema, not abundant, and resembling the sound produced by inflating a bladder. It is supposed to be due to the opening-up of enlarged vesicles. 4. *Compression or collapse râle.* When the lung is compressed or collapsed from any cause, a râle consisting of a number of small dry crepitations may be slowly evolved at the close of, or immediately after a deep inspiration.

(C). CRACKLING OR CLICKING RÂLES.—During the process of softening which the consolidation of phthisis undergoes, certain râles of a crackling character are developed, such as would be expected from the passage of air through such a material. These are named:—1. *Dry crackling* or *dry crepitation,* which consists of some three or four crackles or clicks, sharp, abrupt, and dry, only heard usually during inspiration. It indicates the commencement of softening. 2. *Moist* or *humid crackling* or *crepitation.* Crackling in character, this is more abundant than the dry râle, though the crackles are not large or numerous, but they are more moist, as if air were passing through a less consistent substance, and occur both during inspiration and expiration, being most marked usually in the former. It accompanies a more advanced condition of softening. These râles are chiefly met with at the apices of the lungs.

(D). MUCOUS, SUBMUCOUS, AND SUBCREPITANT RÂLES.—These constitute a very common class of adventitious sounds, the characters of which are readily appreciated. They result from the transmission of air through fluid contained in the air-tubes or vesicles, and the varieties observed depend upon the nature and quantity of the

fluid, and its exact situation. Generally they consist of a number of distinct sounds, usually *bubbling*, but they may have a *crackling*, *rattling*, or somewhat *gurgling* character. The bubbles vary in size considerably, as well as in number and pitch. If they are of large or medium size, the râle is called *mucous;* if small, *submucous;* and if very minute, *subcrepitant*, because it then somewhat resembles a crepitant sound. It accompanies both inspiration and expiration, being generally more marked during the former act, and it may be so abundant as completely to obscure the breath-sounds. A cough often influences these râles greatly, both as to their amount and site, sometimes removing them completely. They are most common and most marked towards the bases of the lungs, but may be heard universally over the chest. In children, and when they originate in the larger tubes, they are apt to have a somewhat metallic character. *Causes.* (i.) Bronchitis. (ii.) Œdema of the lungs. (iii.) Hæmorrhage into the bronchial tubes. (iv.) Rarely fluid from outside the lung emptying itself through the bronchi, such as pleuritic effusion.

(E). Hollow Rales.—The essential character of these abnormal sounds is that they are all more or less hollow in quality, and convey the impression of being originated in a cavity. For their production a hollow space must exist, containing fluid, through which air passes; the size and other conditions of the space will influence their degree of hollowness and their pitch, while the amount and consistence of the fluid will affect the abundance and actual quality of the râle. Hence it may be *bubbling*, *crackling*, or *gurgling;* very variable in size and amount; and much subject to change from time to time. According to their degree of hollowness and pitch these râles have been subdivided into such varieties as *cavernulous*, *cavernous*, *amphoric*, *ringing*, *metallic*, &c. They are heard generally with inspiration and expiration, but may be limited to either portion of the respiratory act. A cough often makes them disappear, or renders them more distinct. Ordinary mucous râles occasionally assume a hollow character, if produced near a large cavity. The heart's action sometimes causes cavernous râles by agitating the fluid in a contiguous cavity. Phthisis is the pulmonary disease in which these râles are chiefly observed, but they may also be noticed in connection with an abscess, or with dilated bronchi. When the pleura contains air and fluid, provided a communication with the lung exists, metallic or amphoric râles may be elicited during the act of breathing.

C. Friction or Attrition-Sounds.

By the rubbing together of the adjacent surfaces of either pleura, when this is the seat of certain morbid changes, adventitious sounds may be elicited during the act of breathing, usually termed *friction-sounds*. In examining for this class of physical signs, it is essential to investigate every part of the chest, but especially its lower portion laterally and behind, as they may be present over but a very small area; and also to make the patient breathe deeply, otherwise the requisite rubbing together of the surfaces may not be brought about.

DESCRIPTION. 1. *Characters.* As a rule friction-sounds are more or less *rubbing* in quality, varying from a slight *graze* to a loud *grating* sound. They may be *creaking*, *crackling*, *clicking*, or *rumbling*. In not a few cases a friction-sound much resembles crackling or even small mucous râles, but is distinguished from these by being unaffected by a cough. *Superficialness* is a prominent character of all these sounds. 2. *Site and extent.* Friction is usually observed on one side, and towards the lower part of the chest, especially about the angle of the scapula, and towards the infra-axillary region. It is generally limited in extent, sometimes not covering an area of more than an inch, but may be heard all over one side, or even over a great part of both sides. 3. *Intensity.* This varies from a scarcely perceptible rub, to a sound audible even at a distance from the chest. Generally it is moderately loud. 4. *Rhythm.* Friction is usually most perceptible during inspiration, but often accompanies expiration also; it may only be heard at the end of a deep inspiration. It is frequently irregular and jerky.

CAUSES. The pathological conditions in connection with the pleura which may give rise to friction-sounds are:—*a.* Increased vascularity, with prominence of the vessels, which may cause a slight grazing. *b.* Deposit of exudation and proliferation of cellular tissue associated with pleurisy, the characters of the sound depending upon the thickness and density of the material formed, and the amount of fluid mixed with it. *c.* Tubercular and cancerous deposits very rarely. It may be mentioned that a cirrhotic liver may originate a sound simulating friction.

D. VOCAL AND CRY RESONANCE.

The chief points to be noticed with regard to the *vocal resonance* are:—1. Its intensity and degree of clearness. 2. Its quality and pitch. 3. The area over which it can be heard. The following are the deviations from the normal which may be met with:—

1. *The resonance may be more or less weakened to complete extinction, over a variable extent of surface.—Causes.* (i.) Air or fluid in the pleura, separating the lung from the chest-wall. (ii.) Very extensive or dense consolidation of the lung, such as cancer or some cases of phthisis. (iii.) Emphysema in many cases. (iv.) Intrathoracic tumours; or enlarged abdominal organs encroaching upon the chest. (v.) Obstruction of the main bronchi, and consequent collapse.

2. *It may be increased in intensity or clearness,* this being often associated with *alterations in quality and pitch.* Four varieties are recognized, which may be considered under this head, namely:—

(i.) *Bronchophony.*—This term merely implies an increase in the clearness of the vocal resonance, which, however, is generally intensified as well. It is commonly noticed in health in the interscapular regions, especially at their upper part; as well as frequently just below the inner end of the clavicles. *Causes.* *a.*

Any lung-consolidation, provided it is not excessive, *e.g.*, phthisis or pneumonia; in the latter the bronchophony has peculiar characters, being *metallic* and *sniffling*. *b.* Small cavities in the lung, with thickening and consolidation around. *c.* Condensation of the lung by pressure in most cases. *d.* Occasionally a solid mass intervening between a bronchus and the chest-wall, provided it is not too large.

(ii.) *Pectoriloquy.*—Here the voice seems to be conducted directly to the ear along the stethoscope, and the words uttered may often be distinctly recognized. The resonance is not uncommonly very intense, and gives a most unpleasant sensation to the listener. *Causes.* *a.* Certain cavities in the lungs in the great majority of cases. The conditions required are that the cavity is of good size, but not too large, and tolerably smooth; does not contain much fluid; has firm but not too thick walls; lies near or is adherent to the chest-walls; and has one or more bronchi communicating with it, so that air may enter. *b.* Very rarely a solid mass between the main air-tube or a large bronchus and the chest-wall. *c.* Occasionally pneumo-thorax.

A variety of pectoriloquy is described under the term *whispering pectoriloquy*, in which a whisper is clearly heard, and often the separate words can be distinguished. This, however, is not an alteration in the voice, but merely a modified expiratory sound. It is only observed in connection with large and superficial cavities, and is best heard in cases of pneumo-thorax, but is not infrequently associated with phthisical cavities.

(iii.) *Œgophony.*—The vocal resonance has a peculiar *bleating* or *nasal* quality in some cases of pleuritic effusion, to which the term *œgophony* has been applied. As a rule it is best heard about the angle of the scapula, but may vary with a change in the position of the patient. Some authorities are of opinion that œgophony is due to the presence of a thin layer of fluid between the lung and the chest-wall; others that it is caused by flattening of some of the bronchial tubes, resulting from superficial compression of the lung.

(iv.) *Amphoric resonance.*—In certain large cavities with firm walls, the voice may have the characteristic hollow, metallic quality known as *amphoric*. This is only very rarely noticed in connection with large phthisical cavities, or in cases of pneumo-thorax.

3. The *area* over which vocal resonance can be heard will be influenced by the same conditions as those which affect the extent of the vocal fremitus.

E. TUSSIVE RESONANCE.

The cough may be intensified in connection with consolidations and cavities, and may assume peculiar characters, hence named *bronchial*, *cavernous*, *metallic*, *amphoric*, etc., but these alterations do not add much to the knowledge gained by studying the vocal resonance, though the tussive resonance may be advantageously made use of where the voice is weak, as in females. The uses of cough in the investigation of disease which can be best turned to practical account are these:—1. During the act adventitious sounds may be elicited, which are not heard during the mere act of breathing, especially in connection with cavities. 2. Various fluid substances which have accumulated in bronchial tubes or cavities may be dispersed and expelled, râles being thus done away with, and the breath-sound rendered louder, so that its characters may be better appreciated. Thus cough may be the means of distinguishing between friction-sounds and sounds produced within the lung; and, in connection with cavities, cavernous or some other breath-sound may sometimes be heard after a cough, where respiration has been previously quite inaudible.

F. Peculiar sounds heard in connection with large cavities.

1. *Metallic tinkling.* Resembling the sound produced by striking a glass vessel with a pin, this is a single, clear, high-pitched, ringing sound, heard in connection with large air-containing spaces, in which there is a little fluid. It is supposed to be occasioned by the bursting of a bubble, or the dropping of fluid from the top of the cavity; and may be originated during the act of breathing, speaking, or coughing, or, rarely, by the action of the heart. Phthisis and hydro-pneumothorax are the diseases in which metallic tinkling occurs.

2. *Amphoric echo.* An echo of amphoric character may attend the respiratory sounds, voice, cough, rhonchi, the heart-sounds, or even the act of swallowing. For its production there must be a large cavity, having a smooth interior, and containing air, such as is met with in pneumothorax, and occasionally in phthisis.

3. *Bell-sound.* In some cases of pneumothorax, when a coin is placed on the chest and struck with another coin, a clear and ringing sound, resembling that elicited by striking a bell, may be heard on listening over another part of the chest.

VI. Succussion.

This is a mode of examination very seldom required, and merely shows the presence of air and fluid in a large space. The signs produced by shaking a patient are:—1. A *splashing-sensation* felt by the hand. 2. A *splashing-sound.* They are occasionally present in hydro-pneumothorax; and extremely rarely in connection with large phthisical cavities.

CHAPTER V.

IN the present chapter the more important symptoms associated with the respiratory organs will be briefly considered.

I. DYSPNŒA.—APNŒA.

DYSPNŒA or *difficulty of breathing* is a symptom requiring careful investigation, as it may be made up of several elements which it is important to distinguish; while it is also requisite to localize the cause of the disturbance, which is not necessarily situated in the respiratory organs.

ÆTIOLOGY.—The conditions which give rise to dyspnœa may be thus arranged:—1. *Some impediment to the entrance of air* through the air-passages, owing to internal obstruction; spasmodic constriction; organic stricture; or external pressure. This may exist in any part of the respiratory passages, from the mouth to the bronchi. 2. *Mechanical interference with the expansion of the chest-walls*, from pressure or rigidity; or with the movements of the *diaphragm*. 3. *Loss of the muscular inspiratory force*, owing to paralysis or spasm. 4. *Deficient expiratory force*, as the result of loss of elasticity of the lungs; or of rigidity of the chest-walls. 5. *Diminution in the working portion of the lungs*, from actual destruction; consolidation; liquid accumulation in the air-cells and minute bronchi; collapse or compression; or obliteration of their minute vessels. 6. Affections of the chest or abdomen which *render the movements of respiration painful*. 7. *Improper conditions of the air inspired*, such as its being too rarefied, or containing irrespirable gases. 8. *Excessive or deficient supply of blood to the lungs*, due to some organic or functional derangement of the heart; obstruction in the pulmonary vessels; actual loss of blood; or violent exercise. 9. *Altered quality of the blood*, associated with anæmia; imperfect aëration; or the presence of poisonous elements in fevers, renal diseases, pyæmia, diabetes, and other affections. 10. *Nervous disturbance*, in connection with hysteria; strong emotion; cerebral disease; brain-poisoning; pressure on the vagus nerves or on some of their branches; or reflex disturbance.

CHARACTERS OF DYSPNŒA.—In studying any case in which there is apparent dyspnœa, it is requisite to observe the following points:—1. Whether any subjective sensation of want of air is experienced, as well as its degree, which may amount to a feeling of impending suffocation. 2. The rapidity of the breathing. 3. Whether respiration is increased in depth and force, or the reverse. 4. If the relative lengths of inspiration, expiration, and the interval are disturbed. 5. If there are objective signs of great want of breath, indicated by the posture of the patient; by the extraordinary muscles of respiration being brought into play; by working of the alæ nasi; or by inability to hold the breath or to speak. 6. Whether any noise accompanies the act of breathing, *e.g.*, stridor or rattling. 7. If air enters freely into the lungs or not. Deficient entrance of air is indicated by more or less sinking in of the lower part of the chest, the epigastrium, and the supra-sternal fossa during inspiration. 8. If there are any signs of imperfect blood-aëration, with their degree. 9. Whether the dyspnœa is constant, or paroxysmal, or subject to exacerbations; and if paroxysms are traceable to any evident cause, such as effort, emotion, taking food, or inhalation of cold air.

SIGNS OF APNŒA OR ASPHYXIA.—The phenomena which accompany interference with the respiratory functions are due partly to over-loading of the venous portion of the circulatory system, and deficient supply of blood to the arterial portion; but chiefly to the blood being imperfectly aërated, and therefore overcharged with carbonic acid, which acts as a poison, especially upon the brain and spinal cord. At first unusual efforts are made to breathe, more or less violent according to the cause of the disturbance of respiration, but these diminish and finally cease, as the central nervous system becomes poisoned. The face is turgid, at first being flushed, but soon becoming purple or livid; or under some conditions it is deadly pale or mottled, accompanied with lividity about the lips, nose, and eyes. Other regions are also blue or livid, especially the nails and other distant parts. Distension of the veins is observed; and the eyes tend to be prominent, suffused, and watery. The temperature becomes reduced, while cold clammy sweats break out. Nervous symptoms soon set in, namely, at first vertigo, disturbance of the senses, mental wandering, twitchings and tremors; followed by drowsiness and stupor ending in complete coma, with convulsions and subsequently relaxation of the muscles, including the sphincters. The pulse is feeble, frequent, and small, but it continues to beat after respiration has stopped, and the heart may be still acting when the pulse has ceased to be perceptible; finally this organ also fails, if the termination is fatal.

Post-mortem examination reveals distension of the right side of the heart and of the veins with dark blood; with intense venous congestion and its consequences, affecting all the organs and tissues.

TREATMENT.—The main indications applicable to the treatment of different cases of dyspnœa are:—1. To remove its cause, if possible. 2. To attend to the posture of the patient, adopting that in which breathing is most easily performed. 3. To avoid all kinds of effort; as well as other causes which are liable to bring on attacks of dyspnœa. 4. To assist the patient by mechanical means, when these are available to make up for impaired respiratory forces. 5. To see that the supply of air is sufficient; as well as that it is pure and otherwise suitable to the conditions of the patient. 6. To remove blood in certain cases, either generally or locally. 7. To administer, either internally or by means of inhalation or subcutaneous injection, remedies which tend to relieve dyspnœa, especially depressants, anti-spasmodics, or stimulants. 8. To employ local measures, such as the application of sinapisms, fomentations of different kinds, turpentines tupes, or free dry-cupping over the chest. 9. To treat the asphyxial condition. For this purpose the most reliable means are the application of sinapisms over the chest and other parts; a warm bath, with free cold affusion over the head and shoulders while the patient is in the bath; slapping the chest with a wet towel; artificial respiration, by Marshall Hall's or Sylvester's method; galvanism along the vagus nerves; and, when necessary, the performance of laryngotomy or tracheotomy.

II. Cough.

Ætiology.—The causes of cough may be summed up under the following heads:—1. An *irritable condition of the mucous membrane* in some part of the air-passages, but especially in the throat and larynx. This is particularly observed in connection with inflammatory affections, the sensibility being then much exalted. 2. Some source of *direct irritation or discomfort* in the throat, larynx, trachea, or bronchi. This may be due to morbid conditions of normal structures, such as the uvula, tonsils, epiglottis, or vocal cords; to the presence of irritating particles or of larger foreign bodies introduced during inspiration; to certain conditions of the air inhaled, such as a very low temperature, or impregnation with irritating gases: or to the collection of secretion or morbid products, *e.g.*, serum, mucus, pus, blood, croupous or diphtheritic deposit. At the same time there is frequently increased irritability of the mucous surface. Cough from this cause may be voluntarily excited, but it is often involuntary and irrepressible, especially when the irritation is in the neighbourhood of the glottis. 3. *Reflex cough.* In many cases cough depends upon reflex irritation, but before deciding that such is its origin, it is always well to look carefully for some more immediate cause. The source of irritation may be associated with the lungs or pleuræ; the heart or pericardium; the alimentary canal (*e.g.*, dyspepsia, dentition, worms); the liver; the peritoneum; the ear; the female generative organs; or the external surface. 4. An *unhealthy condition of the blood.* This is supposed to give rise to cough by its effect on the nervous system, *e.g.*, the state of the blood associated with gout or rheumatism. Most commonly, however, some local cause can be detected in these cases. 5. *Nervous disturbance,* in connection with hysteria, brain-disease, or direct irritation of the respiratory nerves.

Characters of Cough.—This symptom requires investigation with respect to the following particulars:—1. The frequency of its occurrence; and whether it is constant or paroxysmal. 2. The severity and duration of the fits. 3. The mode of onset, whether the cough is a voluntary act, or involuntary and irrepressible, preceded by a sense of irritation in any part; or if it is brought on by some obvious cause, such as exertion, change of posture, or inhalation of cold air. 4. Its particular quality, and the sounds which are produced during the act, both in inspiration and expiration. The chief varieties of cough are hacking, hoarse, wheezing, barking, ringing, metallic, croupy, hooping, crepitous, and aphonic. 5. Whether it is dry or attended with expectoration. In the latter case it is necessary to ascertain whether expectoration is effected easily or with difficulty; and also to make a personal examination of the sputa, observing:—*a.* Their quantity. *b.* General characters, as to colour; odour; whether in one mass or in separate lumps, with the size and shape of the latter; transparency or opacity; amount of frothiness; consistence, and degree of adhesiveness. *c.* If any special substances are evident to the naked eye, such as blood, fibrinous casts, or calcareous particles. *d.* Microscopic characters. *e.* Chemical composition in some cases. 6. If the cough terminates in vomiting; or is followed by relief of any previous unpleasant symptoms.

TREATMENT.—It is not always desirable to check cough, provided it is not excessive, and that it serves some useful purpose in the way of getting rid of materials accumulating in the lungs; indeed in some instances the act should rather be encouraged. In order to put a stop to, or to relieve cough, the chief indications are:—1. To instruct the patient voluntarily to suppress the act as much as possible. 2. To remove the cause of cough if practicable; and avoid everything which is likely to excite it. 3. To administer sedatives and other remedies which will be pointed out under the several diseases. 4. To employ anodyne inhalations, which are very valuable in some cases. 5. To apply local remedies to the throat or larynx, when these parts are in a morbid condition. 6. To limit or check the formation of secretion in the lungs or air-tubes, and thus prevent the necessity for the act of coughing; or to alter its characters, so that it may be more easily discharged. When a patient is obliged to cough, the act may often be assisted by mechanical means, such as by applying a bandage around the lower part of the chest and upper part of the abdomen.

III. HÆMOPTYSIS.

ÆTIOLOGY.—Hæmoptysis or *spitting of blood* signifies the discharge of blood through the mouth, from any part of the respiratory apparatus below the upper opening of the larynx. The sources of the blood, and the immediate causes of this symptom, may be thus classified:—1. *Hæmoptysis independent of obvious local disease.* In this group may be included hæmoptysis from going up a height, from severe straining or coughing, or from blowing wind instruments, which is especially apt to occur in those who are delicate, and whose tissues are weak; vicarious hæmoptysis; that due to the inhalation of irritating substances, or to local injury; and that dependent upon an unhealthy state of the blood, such as scurvy or purpura. 2. *Diseases of the larynx, trachea,* or *bronchi, e.g.*, congestion; inflammation; ulceration; or morbid growths, especially cancer. 3. *Diseases of the lungs,* viz., phthisis, cancer, congestion, acute or chronic pneumonia, abscess, gangrene, hydatids. 4. *Mediastinal tumours* opening into the air-passages, including also glandular enlargements. 5. *Cardiac diseases,* viz., mitral disease; hypertrophy of the right ventricle; or a weak and dilated left ventricle. 6. *Disease of the pulmonary vessels.* 7. *Aneurism opening* into the air-passages. It must be remembered that blood sometimes enters the wind-pipe from the throat or nose, and is then expectorated.

The blood in hæmoptysis generally comes from the capillaries; but not infrequently a considerable branch of the pulmonary artery either gives way, or is perforated by erosion. In phthisis minute aneurisms have been found upon the branches of this vessel, which have ruptured, and thus originated large hæmorrhages.

There may be no immediate *exciting cause* of hæmoptysis; or it is brought on by exertion, coughing, or some other disturbance which affects the pulmonary organs.

Symptoms.—Hæmoptysis may come on without any warning; or is preceded by *premonitory* symptoms, such as weight or fulness about the chest, dyspnœa, a sense of heat, tickling in the throat, or a saltish taste. Usually the blood is brought up by coughing, but it may rise in gulps without any effort, or sometimes comes in a sudden gush, when it may even escape through the nose as well as through the mouth. Not unfrequently vomiting is excited. The quantity of blood varies from a few streaks in the sputa to an amount sufficient to cause instant death. The blood is generally bright and florid, and more or less frothy; but occasionally it is dark and non-aërated, especially when abundant and suddenly discharged. Clots may be observed, but the greater portion is usually liquid. No change in the blood is evident as a rule, either as regards its general or microscopic characters. The duration of an attack of hæmoptysis varies much, but after the more urgent symptoms have subsided, the sputa are generally tinged for some time. Recurrence is a frequent event, and in some cases spitting of blood occurs periodically.

If the blood comes from either lung in any quantity, *râles* of a moist character are generally heard over the corresponding part of the chest.

The effects on the general system will depend on the amount of blood lost; and the rapidity and duration of its discharge. Death does not often result immediately from hæmoptysis, but may happen either from the direct loss of blood, or from its accumulation in the air-passages causing suffocation. Frequently some degree of febrile excitement is associated with hæmoptysis, the pulse being full and bounding, but soft. Should any blood remain in the lungs, it is liable to set up inflammation, and there can be no doubt but that phthisis may be originated in this way.

Diagnosis.—Hæmoptysis may be simulated by bleeding from the mouth or throat; or by epistaxis. The quantity and characters of the blood discharged; the mode of ejection; and, above all, thorough examination of the nose, mouth, and fauces, as well as of the chest, will generally indicate the source of the bleeding. The part of the respiratory apparatus from which the blood escapes is also usually ascertained by physical examination; and by the local symptoms present. Erosion of a large branch of the pulmonary artery is characterized by the discharge of a quantity of dark blood. The diagnosis between hæmoptysis and hæmatemesis is pointed out under the latter. (Vol. II, pages 114—115). The cause of hæmoptysis can only be determined by a thorough investigation of the case, and a due consideration of all its features.

TREATMENT.—Hæmoptysis must be treated on the principles applicable to hæmorrhages in general, but its management will necessarily vary according to its cause. Ordinarily, when the blood escapes from the lungs, the chief indications which require attention are to keep the patient entirely at rest, in a cool room, in the recumbent posture, with the head rather high; to subdue cough as much as possible; to give ice to suck freely; and to administer astringents, with vascular sedatives. *Gallic acid* in full doses with *opium* every two or three hours; *acetate of lead* and *opium; dilute sulphuric acid* with *alum; turpentine;* and *ergot of rye,* are the most useful remedies. At the Brompton Hospital the *gallic acid* and *opium* mixture is usually found very efficacious. The subcutaneous injection of *ergotine* has of late years come into much repute. *Digitalis* is of great value if the heart is acting excitedly. Saline aperients are useful in plethoric patients. Some practitioners have recourse to venesection or local abstraction of blood, but this is rarely a desirable plan of treatment. The application of ice to the chest is often exceedingly beneficial, but it must be done carefully, the ice being removed by degrees. Dry-cupping over the chest is serviceable in some cases. It is sometimes useful, when a case does not yield to ordinary treatment, to draw the blood towards the limbs by means of hot foot-baths or a Junod's boot; or to apply ligatures around the extremities, so as to confine the blood to the head and trunk. In hæmorrhage vicarious of menstruation, or due to stoppage of bleeding from piles, the application of leeches to the lower extremities, or around the anus, is said to do good. In all cases of hæmoptysis of any moment, it is important to keep the patient under observation until any irritation due to the presence of the blood in the lungs has entirely subsided. If there is any tendency to spitting of blood, everything likely to bring on an attack must be avoided; while at the same time the condition of the blood is improved by proper dieting, and by the administration of *tincture of steel.*

CHAPTER VI.

DISEASES OF THE LARYNX AND TRACHEA.

I. ACUTE INFLAMMATION—ACUTE LARYNGITIS AND TRACHEITIS.

ÆTIOLOGY.—*Predisposing causes.* All forms of acute inflammation of the larynx and trachea are predisposed to by certain conditions, namely, a lax, weakly, and ill-nourished state of the system; effeminate habits; immoderate wrapping up of the neck; previous attacks, especially if repeated; and a climate or season characterized by a cold moist atmosphere, cold winds, or rapid changes of temperature, the complaint being therefore more prevalent during winter and spring. Males suffer more than females. *Laryngeal catarrh* is most common among adults; but the *croupous* variety is essentially a disease of childhood, especially from the first to the seventh year, being rarely met with after ten years of age. Unfavourable sanitary conditions predispose to croup, and the children of the poorer classes chiefly suffer from this complaint.

Exciting causes. These may be arranged as follows:—1. *Direct irritation*, from breathing very cold or hot air, steam, acrid vapours, or air containing irritating particles; or from swallowing boiling or corrosive liquids. 2. *Excessive coughing;* or *violent exercise of the voice*, in speaking, shouting, and singing. 3. *Morbid conditions* affecting the larynx or trachea, such as ulcers or growths. 4. *Local injuries* or *operations.* 5. *Direct exposure* of the front of the neck to a cold draught. 6. *General exposure to cold*, the larynx being either involved alone, or along with other mucous surfaces. 7. *Extension* of inflammation from the nose or pharynx; or occasionally from the bronchi. 8. Certain *febrile conditions*, in which laryngitis occurs as a complication, especially influenza, erysipelas, measles, and typhus fever. 9. *Secondary syphilis.*

The ætiology of certain special forms of laryngitis demands separate notice. *Œdematous* laryngitis generally follows some previous laryngeal disease, but may be due to mere cold; it is also particularly liable to arise from swallowing boiling liquids. This usually happens among the children of the poor, who are in the habit of drinking out of the spout of the tea-kettle. Laryngeal inflammation complicating erysipelas is likewise prone to be attended with œdema. *Croupous* inflammation has recently been the subject of much discussion. French writers have always regarded this variety as identical with *laryngeal diphtheria*, and therefore as always resulting from contagion or from bad hygienic conditions. Several high authorities in this country have come forward in support of this view. The general belief, however, is that there is a distinct form of *croupous* laryngitis, having no connection with diphtheria, but originating in exposure to cold, especially to northerly or north-easterly winds, or in a general chill. Occasionally this morbid condition is met with as a secondary complaint, in the course of some of the exanthemata, viz., small-pox, measles, scarlatina, typhus or typhoid fever, or erysipelas.

ANATOMICAL CHARACTERS.—The morbid appearances will differ according to the nature and products of the inflammation. In *catarrhal* laryngitis more or less bright redness is usually observed, with swelling, opacity, and slight softening of the membrane. Spots of epithelial erosion are common, but actual ulceration is very rare. After a time secretion forms, which is sometimes very viscid, containing an abundance of young cells. *Œdematous* laryngitis is characterized by the accumulation of serum in the sub-mucous tissue, especially where this tissue is very lax, which gives rise to much translucent swelling, with a sodden, flabby condition of the structures, but the redness is less marked.

Very rarely sero-purulent or purulent fluid infiltrates the tissues. In low fevers gangrene may occur.

The special anatomical character of *croupous* or *plastic* laryngitis is, that the surface of the mucous membrane becomes covered to a variable extent with a croupous exudation or so-called *false membrane*, the epithelium being destroyed. This may be limited to a small portion of the surface, or to separate patches; or it may cover the whole of the larynx and trachea, occasionally extending even into the smaller bronchi. Its main seat is said to be the trachea. In thickness the deposit may range from a mere film to two or three lines or more. The consistence varies, but the material is generally tolerably tough, compact, and adherent for a time, finally becoming detached.. Its under surface frequently presents little points of extravasation. A fresh deposit not uncommonly forms after the membrane is separated, and this may be repeated several times. Under the microscope it is seen to consist of an amorphous or finely-fibrillated substance, in which abundant young cells are involved. There is very little swelling of the mucous membrane as a rule; and its structure is not at all affected.

When death results from acute laryngitis, especially the croupous variety, some of the following morbid conditions are usually present, viz., bronchitis; congestion and œdema of the lungs; lobular or lobar pneumonia; localized insufflation and collapse; distension of the heart and venous system with dark blood; congestion of the organs generally; and slight serous effusions. The lymphatic glands which are situated beneath the thyroid body on each side of the trachea may be enlarged.

SYMPTOMS.—The clinical history of acute inflammation of the main air-tube differs in the several varieties of this disease, and therefore each form calls for separate consideration.

I. ACUTE CATARRHAL LARYNGITIS AND TRACHEITIS. LARYNGEAL AND TRACHEAL CATARRH. CYNANCHE LARYNGEA.—This variety assumes very different degrees of severity, but the following are the usual symptoms:—Unpleasant sensations are experienced over the wind-pipe, such as dryness, roughness, constriction, soreness, burning, or tickling, which are increased by coughing or speaking. These are chiefly felt when the upper part of the larynx is involved. Swallowing is often rather painful. The voice is husky, and frequently hoarse or cracked, or it may become quite lost. Cough is commonly a prominent symptom, there being a constant tendency to paroxysmal attacks. It is harsh and hoarse in quality; or may become completely aphonic. The patient is also often disposed to hawk repeatedly. At first there is no expectoration, but after a while a little clear viscid mucus containing young cells may be expelled with difficulty, this finally becoming more abundant and muco-purulent. Respiration is not much interfered with in ordinary cases.

Laryngeal catarrh occurring in young children is liable to be attended with far more serious symptoms, owing to the small size of the air-tube in such subjects; to the edges of the glottis being glued together by viscid secretion; and to the tendency to laryngeal spasm.

There can be no doubt but that this is the condition present in a large proportion of cases of so-called *croup*, constituting what has been termed *stridulous laryngitis* or *false croup*. Breathing is much obstructed and of a stridulous character; and all the croupy symptoms to be presently described may be present.

In some cases of catarrhal laryngitis there are no general symptoms, but usually more or less pyrexia is observed. In children there may be the ordinary signs of deficient blood-æration.

2. Œdematous Laryngitis.—Œdema may supervene very rapidly, and in the course of an apparently slight attack of laryngeal catarrh. It is a highly dangerous condition, and, if not relieved, may cause speedy suffocation. The characteristic features of œdematous laryngitis are a sensation of the presence of a foreign body in the larynx; more marked dysphagia; and urgent dyspnœa of laryngeal characters, inspiration being whistling or hissing, but expiration being comparatively or quite easy. Voice is completely lost; and cough becomes aphonic. It is usually believed that spasm of the glottis aids in the causation of dyspnœa in cases of œdematous laryngitis; but some authorities are of opinion that the muscles are paralyzed.

The general symptoms are indicative of more or less grave interference with the respiratory functions, and consequent deficient blood-aëration.

3. Croupous or Plastic Laryngitis. Membranous Croup. True Croup. Cynanche Trachealis.—An attack of *idiopathic* or *primary* croup is frequently preceded by some *premonitory* symptoms for a day or two, such as slight harsh cough, hoarseness, and sore-throat; with a little pyrexia and constitutional disturbance. In some cases, however, the disease comes on suddenly, and without any previous warning. An attack of croup usually sets in during the night, while the child is asleep, and when established the symptoms are very characteristic.

Local. The voice is at first harsh and hoarse, or at times cracked and shrill, finally becoming whispering or being completely lost. Paroxysms of spasmodic, "croupy" cough come on, short, sharp, and abrupt in character; dry; of high pitch; and of somewhat metallic, clanging, or brassy quality. The cough is interrupted by a shrill, ringing, whistling, or "crowing" inspiration. Soon it becomes husky and muffled, and at last loses all sound. Respiration is greatly impeded, and presents some peculiar characters. The act is exceedingly laboured, and attended with violent effort; it is also prolonged, and therefore not frequent; while inspiration is accompanied with a high-pitched, metallic, sibilant, or wheezing stridor, which may be heard at some distance off.

These symptoms are not persistent, but there are intervals of complete or comparative ease, especially during the day. In severe cases, however, or in the advanced stage of those tending towards a fatal issue, there may be scarcely any remissions. The paroxysms of dyspnœa are commonly believed to be partly caused by spasm of the muscles, but Niemeyer argued that these are paralyzed.

The child often grasps its throat, or puts its hand to its mouth, as if attempting to remove some obstruction, and if old enough may complain of local pain. A little thick viscid mucus is sometimes brought up by coughing; and in some cases flakes, or larger patches, or even a cast of exudation may be expectorated, which may be followed by temporary or permanent relief. Deglutition is sometimes difficult.

General. At first the general symptoms are of a febrile character, and the temperature may rise to 102°, 103°, or more; the pulse being frequent, full, and hard. Subsequently, however, the pyrexia abates; and in severe cases the prominent signs are those associated with imperfect aëration of blood, which are intensified during the paroxysms. Ultimately in fatal cases gradual or rapid suffocation ensues, attended with the phenomena of apnœa. Pulmonary complications frequently arise, and the danger is thus increased.

Secondary croup may set in during the course of the diseases already mentioned, giving rise to more or less severe symptoms resembling those met with in primary croup.

PHYSICAL EXAMINATION.—*Examination of the throat,* by inspection and the use of the finger, may reveal the condition of the epiglottis, should it be red and swollen; and also the presence of œdema. *Auscultation* over the wind-pipe may detect changes in the laryngeal breath-sound, or local mucous râles; or sometimes in croupous laryngitis a peculiar rhonchus, named *tremblotement,* is heard during inspiration and expiration, supposed to be due to the flapping of a piece of false membrane; probably this sound can be produced by thick mucus. The *laryngoscope* is often inapplicable, especially if the epiglottis is much affected, and also in cases of croup; when it can be employed, it might reveal bright redness, turgidity, swelling, œdema, or alteration in shape of various parts; or thick secretion or croupous deposit might be visible. *Examination of the chest* indicates more or less interference with the entrance of air into the lungs in cases of œdematous or croupous laryngitis, especially when children are affected. The pulmonary sound may be obscured by a loud laryngeal sound; and mucous râles are sometimes heard over the chest. Pulmonary complications give rise to their own special physical signs.

COURSE, DURATION, AND TERMINATIONS.—The course and duration of simple laryngeal catarrh vary considerably. Recovery is the usual termination, but the affection is very liable to recur, or it may become chronic; in young children also it may prove fatal. Œdematous laryngitis is often fatal, and death may take place very suddenly, or with great rapidity. Croupous laryngitis in children usually runs a remittent course, exacerbations occurring during the night; occasionally it progresses continuously. Some cases terminate within twenty-four hours, and most end within five days; they may continue, however, for ten days or a fortnight. The clinical terminations are in death or recovery. Death generally results from apnœa, but may be due to asthenia. Recovery is indicated by the subsidence of the local and general symptoms; at the same time the cough becoming looser, with more abundant muco-purulent expectoration, or sometimes a quantity of exudation being expelled.

DIAGNOSIS.—The diagnosis between affections of the throat and larynx has already been pointed out when describing the former. In children the different forms of acute laryngitis have to be distinguished from hooping-cough; bronchial catarrh, with a tendency to spasm; and diphtheria: as well as from other conditions affecting the larynx itself, viz., laryngismus stridulus; acute exacerbations in connection with chronic diseases, such as morbid growths; and conditions resulting from the presence of foreign bodies, or from external injury. Only *diphtheria* and *laryngismus* can be specially noticed here, but it is necessary to insist upon the importance of carrying out a thorough physical examination in all cases. *Diphtheria* involving the larynx may be generally diagnosed from all forms of laryngitis by the following characters:—1. The complaint may be epidemic, or a history of contagion may be traced. 2. Premonitory general illness may have been felt for some days, with a tendency to asthenia. 3. Marked throat-symptoms are usually present, preceding the laryngeal symptoms. 4. The glands about the jaws are enlarged. 5. Epistaxis and albuminuria frequently occur. 6. Laryngeal symptoms are not so urgent as a rule. 7. Examination of the throat reveals the diphtheritic deposit. *Laryngismus stridulus* is more sudden as regards the onset and cessation of the paroxysms of dyspnœa; and these are often brought on by some obvious cause. A history of previous similar attacks can generally be obtained. There may be signs of general convulsions, with turning-in of the thumbs. The characteristic cough of croup is not present, but the child often cries. There is complete restoration between the paroxysms. Pyrexia is absent.

It is necessary to distinguish between the different forms of laryngitis. *Laryngeal catarrh* is most common in adults; it has less severe symptoms, and no croupous cough, but more abundant expectoration; there is but little pyrexia; the complaint is often accompanied with much nasal catarrh. *Œdematous* laryngitis is rare in children, except as the result of drinking boiling water. It generally supervenes upon some previous disease of the larynx. Expiration is comparatively easy. Cough soon becomes completely aphonic; and the voice is also lost. The œdematous parts may be seen or felt. It is by no means easy in many cases to recognize the nature of an *inflammatory croupy attack* in children. *Catarrhal* laryngitis may, however, be often distinguished from true croup by the fact that the patient is subject to similar attacks in cold seasons; while the symptoms are less severe and more remittent; and the termination is rarely fatal. The expulsion of false membrane is a certain indication of *croupous* laryngitis. Laryngoscopic examination might afford some aid in the diagnosis of the several forms of laryngeal inflammation.

PROGNOSIS.—All forms of laryngitis are to be regarded as serious. The *œdematous* variety is very grave, especially that form which is due to the swallowing of boiling liquids. *Croup* is a most fatal disease. The prognosis is worse in young infants; and there is more danger in proportion to the severity and persistence of the local symptoms, the degree of interference with respiration, and the signs of blood-poisoning. Early treatment gives a better chance of recovery.

TREATMENT.—There are certain *general* matters which it is essential to attend to in the treatment of all the varieties of acute laryngeal inflammation. The patient should remain in a warm room, the temperature being kept uniformly at 65° or higher, and the air rendered moist by means of steam. In the case of children it is advisable to make a tent over the bed, as described under diphtheria, and it may be necessary to raise the temperature of the air considerably. All exposure must be avoided, the throat and chest being warmly covered. Rest to the larynx is imperative, so far as it can be obtained: and in many cases it is requisite to urge patients to restrain cough as much as possible.

In the case of adults the assiduous employment of inhalations of steam is one of the chief measures to be adopted, and Dr. Morell-Mackenzie recommends the addition of some *tincture of benzoin*, *hop*, or *conium juice* to the boiling water, or a few drops of *chloroform* occasionally, should there be much tendency to spasm. If the attack results from a cold, it is desirable to excite diaphoresis by means of warm drinks, a hot or vapour-bath, and external warmth. The diligent employment of hot applications over the front of the neck is useful, such as a sponge dipped in boiling water and then squeezed dry. Some practitioners prefer cold applications. If the inflammation is advancing, and especially if it has spread from the throat, it is recommended to apply directly and efficiently a solution of some astringent, either with a brush or sponge, or by the aid of an atomizer. *Nitrate of silver*, *alum*, *tincture of iron*, *chloride of zinc*, and *tannin* are the substances chiefly employed in this manner. In some cases an emetic of *sulphate of zinc* or *tartar emetic* at the outset is decidedly useful, but the former practice of giving repeated depressing emetics, combined with bleeding, blistering, and the administration of calomel, is most objectionable. Occasionally it might be advisable in severe cases to apply a few leeches over the upper part of the sternum.

The bowels should be kept freely opened, and a diaphoretic saline mixture may be given. If there is much distressing cough, some sedative may be administered with due precautions, such as a few drops of *compound tincture of camphor* or *liquor morphiæ*.

The treatment of children must be similar whatever the nature of the inflammation may be, and it is necessary to be exceedingly prompt in attending to the first indications of anything wrong in connection with the windpipe in such subjects. A warm bath should be employed immediately, the patient being then dried and wrapped up in blankets, while hot sponges are constantly applied over the larynx. The persistent use of cold compresses has been advocated, and is certainly deserving of more extended trial. If the symptoms are at all severe, unquestionably great relief often follows the action of an emetic, though Niemeyer affirmed that "they are only indicated where obstructing croup-membranes play a part in producing the dyspnœa, and when the child's efforts at coughing are insufficient to expel them." *Tartar emetic* and *ipecacuanha* are preferred by many practitioners, and may be given to robust children; but *sulphate of zinc* answers best in weakly subjects.

Bleeding has been extensively practised in croup, but it should not be had recourse to as a mere routine measure. Leeches are often of great service in the case of healthy plethoric children, when applied at an early period, especially if there are signs of local blood-stasis. They are best applied over the upper piece of the sternum, the number being regulated according to circumstances. Notwithstanding the high authorities by which the regular administration of *calomel* is supported, I have never seen any good result from it in this disease, but have more than once known it do a great deal of harm, and therefore cannot but express my decided objection to the repeated employment of this drug. It may be advantageous to give one dose as a purgative at the commencement. The bowels should be kept freely open, and for this purpose enemata answer best. It is difficult to determine what internal remedies are most serviceable in the treatment of laryngeal inflammation in children, but it has appeared to me that most benefit is derived at first from salines combined with small doses of *tartar emetic* or *ipecacuanha wine*. The cough must be rather encouraged than checked, unless it is unduly severe, and therefore sedatives are generally contra-indicated. Later on stimulant expectorants are required, such as *ammonia* with *chloric ether* and *syrup of squills*. Some practitioners recommend the administration of *alkaline carbonates* or *chlorate of potash*. Dr. Ringer strongly advocates the use of drop doses of *tincture of aconite*.

Counter-irritation is not attended with much benefit, but Dr. Squire considers the application of *tincture of iodine* to the sides of the neck of some service, especially if covered with water-dressing. Attention to diet is often of much importance. At first the food should consist chiefly of milk, with cooling drinks, but nourishing soups or meat-juices are required when the system shows any signs of failure. Alcoholic stimulants are not usually needed unless some pulmonary complication supervenes. If nourishment cannot be taken by the mouth, it may be necessary to have recourse to nutrient enemata.

The question of the performance of *tracheotomy* is in many cases one of the greatest moment. It seems to me that if the symptoms increase in gravity in spite of treatment, and if signs of apnœa set in, the operation ought to be performed without delay, as affording the only chance of recovery, due care being taken both in its performance, and in the subsequent treatment.

For *œdematous* laryngitis the most effectual remedies are emetics which act with rapidity; the constant sucking of fragments of ice; and efficient scarification. In case of need, tracheotomy must be resorted to.

Secondary croup calls for the administration of stimulants, along with abundant nutriment. *Tincture of steel* and *mineral acids* are the most efficient medicines in this affection.

Complications must be treated as they arise. Signs of apnœa must be combated by the usual measures. It is necessary in cases of recovery to exercise great care during convalescence. As prophylactic measures in those subject to croupy attacks, cold douching of the throat and chest, with dry friction afterwards; the wearing of proper clothing; and the avoidance of cold damp winds and night air, are the chief things to be attended to.

II. Chronic Laryngitis.—Chronic Laryngeal Catarrh.

Ætiology.—This affection may arise as a sequel of acute laryngitis, but its chief causes are:—1. *Excessive use of the voice*, as in speaking, shouting, or singing. It constitutes the chief morbid condition in *clergyman's sore throat*. 2. *Phthisis* and *syphilis*. 3. Irritation *extending from the throat*. 4. Some *local irritation* in the larynx, especially from ulceration or morbid growths; and also *external pressure* upon this tube. 5. *Irritation of the recurrent nerve*. 6. Habitual *inhalation of irritant particles*. 7. *Chronic alcoholism*. 8. *Excessive smoking*. 9. Occasionally *general plethora;* or a peculiar *constitutional condition*, attended with a disposition to chronic catarrh.

Anatomical Characters.—These differ according to the duration, seat, and extent of the affection; and the variety which it assumes. More or less hyperæmia is generally observed, and the vessels may be evidently enlarged, especially in the form known as *phlebectasis laryngea*. The mucous membrane tends to become thickened and firm, as well as the submucous tissue, particularly in phthisis and syphilis. Sometimes a state of chronic œdema is present. The surface is either dry and shining, or presents small collections of mucus, or more abundant secretion. In *glandular* or *follicular* laryngitis, which is the condition observed in *clergyman's sore-throat*, the morbid changes are chiefly confined to the racemose glands of the larynx, these being enlarged and red. The canal of the air-tube may be much dilated or contracted, particularly in chronic laryngitis associated with phthisis or syphilis, its various parts being in some cases much altered in shape and appearance, and its surface uneven. Erosions and ulcerations are common. Sometimes hæmorrhage occurs. In phthisis a chronic œdema of one or both ary-epiglottic folds is often observed, which is said to be pathognomonic. They look like pale, solid, pyriform enlargements, the large ends lying against each other in the middle line, and the small ones being directed upwards and outwards.

Symptoms.—In many cases of chronic laryngitis unpleasant and irritating sensations are experienced in the larynx, which are worse after speaking, but they are not marked as a rule. Alterations in the voice constitute the most important, and not uncommonly the only symptom of this disease. The voice is more or less weakened to complete aphonia, often hoarse and harsh, deep-toned, or cracked. It is subject to variations, and in the slighter cases frequently improves if the patient speaks for a time. The changes in the voice may only be noticed during loud talking.

Paroxysms of spasmodic cough cause much distress in some cases, but this symptom may be completely absent. Many patients have a short, tickling cough; others hawk frequently, in order to clear away viscid secretion. The cough may be hoarse, cracked, barking, or aphonic; and is sometimes attended with much expectoration. Breathing is only disturbed when there is much thickening of tissues or œdema, with consequent narrowing of the larynx, and under these circumstances there may be considerable dyspnœa, with stridulous inspiration. Slight dysphagia is sometimes experienced.

The laryngoscope reveals the precise appearances presented by the larynx; and may further show that the muscles of the glottis do not act properly. Sometimes mucous râles can be heard over the larynx with the stethoscope.

There are no general symptoms directly due to chronic laryngitis, but the system is often affected, owing to some other local or constitutional affection being associated with this complaint.

This disease frequently aggravates the symptoms due to other forms of organic mischief in the larynx, such as ulceration or morbid growths.

III. Ulcers of the Larynx.

The forms of ulceration which are met with in the larynx include:—1. *Catarrhal*, which are superficial. 2. *Follicular*. These are chiefly associated with chronic laryngitis. 3. *Variolous*, resulting from small-pox pustules. 4. Ulcers in connection with *typhus* and *typhoid fever*, which generally spread extensively and deeply. 5. *Phthisical* or so-called *tubercular*. Laryngeal ulcers in cases of phthisis do not by any means always originate in tubercle. Usually they are minute and circular at first, being often observed at the back of the ventricular bands, and on the under surface of the epiglottis; by their union they give rise to large and irregular ulcerations, which may spread extensively. Sometimes ulceration begins on the vocal cords. Generally it does not cause deep destruction of tissues, but it may do so. The epiglottis is often eroded at its margins, and its cartilage may be exposed or perforated. Calcification and necrosis of the cartilages not infrequently follow phthisical ulceration. 6. *Syphilitic*. Occasionally secondary syphilitic ulcers are met with in the larynx, which are limited, superficial, and may occur in any part. Tertiary ulcers exhibit a special tendency to begin on the epiglottis; they spread rapidly, both in extent and depth, causing great destruction of tissues, and presenting irregular ragged edges. In some cases the ulceration invades upon the larynx from the throat; or it may originate in the breaking-down of gummata. Sometimes it extends at one part, while cicatrizing at another. The scars have a great tendency to contract, and thus to narrow the calibre of the larynx, or to cause adhesion and distortion of structures 7. *Cancerous*. These are very rare.

Symptoms.—In many of the slighter cases no special symptoms are noticed, and the same remark applies to those ulcerations which are associated with the acute fevers.

Painful sensations may be felt in the larynx, of a burning, smarting, or pricking character, increased by coughing or speaking; with tenderness on pressure. Deglutition is difficult or painful if the epiglottis is involved, especially as regards liquids. The voice is often altered in quality, being harsh, hoarse, or cracked, as well as weak. Suffocating fits of cough are common; and pus, blood, or laryngeal tissues may be expectorated. Breathing is frequently noisy and of laryngeal characters, and there may be urgent dyspnœa. In many cases the throat is simultaneously affected. Cicatrization of an ulcer may give rise to signs of permanent stricture of the larynx.

IV. Morbid Growths in the Larynx.

The abnormal growths and tumours which may be found in the larynx are either *malignant* or *non-malignant*. The *malignant* growths include:—1. *Epithelial.* 2. *Encephaloid.* 3. *Scirrhus.* All the varieties are extremely rare, epithelial being the most common, and they usually extend to the larynx from other parts. The *non-malignant* comprise:—1. *Syphilitic condylomata* and *mucous tubercles.* 2. *Papillomata.* 3. *Mucous polypi* or *fibro-cellular tumours,* either pedunculated or sessile. 4. *Fibrous tumours* or *polypi.* 5. *Cystic growths.* 6. *Lipomata.* 7. *Erectile vascular tumours.* 8. *Enchondromata.* 9. *Hydatids.* Those last-mentioned are of extremely rare occurrence.

Symptoms.—The size, situation, number, and nature of the morbid growths, as well as the size of the larynx, will necessarily influence the local symptoms. Rarely is there any pain, but occasionally a feeling of the presence of a foreign body is experienced; or a sense of obstruction or uneasiness. Dysphagia is sometimes felt. The voice is often partially or completely lost and altered in quality, and it is liable to sudden changes. More or less dyspnœa is usually felt, while the breathing may be stridulous; this symptom is also subject to rapid variations, and frequent suffocative attacks may come on, which are due to spasm. When the growth is situated above the glottis, expiration is often quite free. The removal of part of a growth may increase the dyspnœa, in consequence of its position being disturbed. Cough is present in many cases, varying in its characters, and it is not infrequently voluntarily excited with the view of trying to get rid of the obstruction. In the expectoration, which is usually increased and abnormal, fragments of the growth are sometimes expelled, but Dr. Morell-Mackenzie states that the microscopic examination of these cannot be relied upon for differential diagnosis. Laryngoscopic examination reveals the nature and seat of any growth. Sometimes it extends through the upper opening of the larynx, so that it is visible on inspection of the throat, or can be felt with the finger. A characteristic valvular murmur has been described as being heard over the larynx during breathing, but this is not reliable. Examination of the chest often reveals obstruction to the entrance of air into the lungs.

The mere interference with the function of respiration is liable seriously to affect the general system; and, if the growth is cancerous, the usual cachexia is often observed.

V. ŒDEMA GLOTTIDIS.

ÆTIOLOGY.—The loose submucous tissue which is present in some parts of the larynx is very liable to become the seat of œdema, which may arise under the following circumstances—1. In connection with *acute laryngitis*, especially that due to local irritation. 2. From the irritation induced by *chronic laryngeal diseases*, *e.g*, ulcers, growths, or necrosis of cartilages. 3. As a *complication* of some of the acute specific fevers, viz., scarlatina, erysipelas, small-pox, typhus, and typhoid. 4. By *extension* of inflammation from the throat. 5. Occasionally as a part of *general dropsy* from renal disease; and possibly from cardiac or venous obstruction.

The *symptoms* are similar to those described as indicative of *œdematous laryngitis*.

VI. LARYNGEAL PERICHONDRITIS. ABSCESS. NECROSIS OF THE CARTILAGES.

These rare morbid conditions may be briefly considered together. In *perichondritis* an exudation is said to collect between the perichondrium and cartilages, especially the cricoid, where afterwards pus forms, while the cartilages necrose, and are finally discharged in fragments. The irritation may lead to the formation of abscesses in the parts around.

Usually these changes are associated with ulceration. Necrosis of the cartilages is by far most frequent in cases of phthisis. Syphilis, abuse of mercury, low fevers, and cold have been set down as very rare causes of this disease.

SYMPTOMS.—These are considerable limited pain; extremely irritable cough; marked alterations in voice; and usually severe dyspnœa; followed by expectoration of fragments of cartilage, and signs of abscesses.

VII. FUNCTIONAL OR NERVOUS AFFECTIONS OF THE LARYNX.

1. DISORDERS OF SENSATION.—The larynx is occasionally the seat of hyperæsthesia with irritable cough; of neuralgia; or of more or less diminution in sensibility, which may amount to complete anæsthesia.

2. LARYNGISMUS STRIDULUS—SPASM OF THE GLOTTIS—SPASMODIC CROUP—SPURIOUS CROUP—CHILD-CROWING.—This condition results from a spasmodic action in connection with the muscles which close the glottis, the proximate cause being some irritation conveyed by the laryngeal nerves. The irritation may be—1. *Centric*, originating in the brain, either from some organic mischief, such as hydrocephalus; or from disturbance of its circulation or nutrition. 2. *Direct*, from irritation of either vagus or recurrent nerve by

enlarged glands, tumours, or other morbid conditions. Formerly the complaint in children was called *thymic asthma*, on the assumption that it was due to pressure by an enlarged thymus gland. 3. *Reflex*. The reflex irritation may arise in the larynx itself; or may be associated with dentition, improper feeding, especially in the case of infants brought up by hand or nursed by unhealthy mothers, worms, a cold draught blowing on the skin, and various other reflex disturbances.

Laryngismus stridulus is a very common complaint in children, especially during the first and second years of life. In adults it is only rarely observed, either in connection with hysteria, or as the result of pressure on the laryngeal nerves by aneurisms and other tumours, or from direct irritation by foreign bodies or gases. The complaint is most frequent among male children, and among those living in the crowded parts of large towns and cities, especially if brought up by hand, and exposed to unfavourable hygienic conditions. Scrofulous children are said to be more subject than others, and rickets decidedly predisposes to the affection. It has been suggested that in the latter disease the laryngismus is due to pressure upon the brain when the child lies on its back, owing to the thinness of the occipital bone, but this is very questionable.

There may or may not be some obvious *exciting cause* of an attack. Thus it sometimes comes on during the act of swallowing; from tossing up the child in the air; or from severe mental emotion, especially fright or anger.

Symptoms.—In children an attack of laryngismus in most cases comes on at night during sleep, and is very sudden in its onset. The prominent symptom is dyspnœa, more or less intense, attended usually with stridulous, crowing inspiration, but the glottis may be for a moment completely closed, so that no air can enter, and respiration ceases entirely. The child struggles for breath, and presents to a greater or less degree the appearances associated with apnœa. Often there are general convulsions, with "carpopedal" contractions, strabismus, and sometimes involuntary discharge of fæces and urine. The attack subsides suddenly or very rapidly, and in many cases the child cries. Restoration is complete, and there is neither alteration in the voice nor cough. Pyrexia is usually absent.

An essential character of this complaint is the great tendency to the recurrence of the attacks. They vary in frequency, duration, and severity, but tend to become more frequent, longer, and more intense as the case progresses. Ultimately death from suffocation not infrequently occurs during one of the attacks.

The spasmodic affections met with in adults do not call for any particular remark. Hysterical cough is believed to be sometimes due to a spasmodic tendency in the adductors of the cords during expiration; and the sharp ringing cough which occasionally affects children is supposed to have the same cause, the spasm being reflex (Morell-Mackenzie).

Diagnosis.—The only affection likely to be mistaken for laryngismus is inflammatory croup, and the diagnosis between these affections has already been pointed out.

PROGNOSIS.—Most cases of reflex origin recover, but those due to other causes are very serious. Much will depend upon the state of health of the child, and the severity and frequency of the fits.

TREATMENT.—During a paroxysm of laryngismus in children, measures must be immediately adopted for the relief of the spasm. Slapping or rubbing the back; shaking the child; dashing cold water in the face; fanning; tickling the throat so as to excite vomiting; the use of a warm bath alone, or with cold douching while the patient is in it; and holding ammonia to the nostrils, are the most effectual measures. A rapid emetic is useful if it can be taken; and, if the attack persists, enemata containing *assafœtida* or *valerian* may be employed, sinapisms being also applied to the chest. Artificial respiration is sometimes serviceable. At the same time it is most essential to seek for any source of *reflex* irritation, and to remove this; for instance, lancing the gums often gives speedy relief. In prolonged cases inhalation of *chloroform* may be carefully tried; and sometimes it is necessary to have recourse to *tracheotomy*, which may be performed even after apparent death.

During the intervals it is important to look to the diet; to regulate the state of the alimentary canal; and to improve the general health, or treat any special constitutional condition, especially rickets. Tonics, change of air, and salt-water bathing often do much good.

In adults the main indications are to remove the cause of any spasm; and to use sedative inhalations.

3. LARYNGEAL PARALYSIS. PARALYSIS OF THE MUSCLES OF THE VOCAL CORDS.—Paralysis of the muscles of the larynx may arise:—1. As the result of some *local organic mischief*, past or present. 2. From *pressure* upon, or *traction* of the pneumogastric or recurrent nerves, one or both, by tumours, enlarged glands, &c. 3. After *diphtheria;* and, rarely, after *typhus* or *intermittent fever*. 4. In connection with *hysteria*, especially if there is much debility. 5. From chronic poisoning by *lead* or *arsenic*. 6. Very rarely from *centric disease* in the brain or upper portion of the spinal cord. 7. As a consequence of *atrophy and degeneration of the muscles*.

VARIETIES AND THEIR SYMPTOMS.—Four chief varieties of laryngeal paralysis are described viz.:—

(i.) *Bilateral paralysis of adductors—Hysterical* or *Functional aphonia*. Voice is lost, but cough is usually attended with sound. The patient sometimes speaks in a scarcely audible whisper. The laryngoscope shows that the vocal cords remain apart, either partially or entirely, during attempted phonation; and they may be perfectly motionless.

(ii.) *Unilateral paralysis of adductors*. Voice is altered, and there may be a permanent falsetto. The sound produced during coughing, sneezing, or laughing, is usually much changed and weakened. The laryngoscope reveals that one cord does not act when the patient attempts to speak or cough, and that it is usually congested.

This form of paralysis is usually due to some direct cause acting upon the supplying nerve.

(iii.) *Bilateral paralysis of abductors.*—Here the prominent symptom is dyspnœa, with noisy, stridulous inspiration, always present more or less, but subject to severe exacerbations, especially after exertion, or on taking a deep inspiration. Voice is not much affected, but may be harsh. Laryngoscopy discloses that the cords lie close together near the median line, and do not separate when an inspiration is made. Some observers maintain that this is the pathological condition present in laryngismus stridulus, and not spasm.

(iv.) *Unilateral paralysis of the abductors* is attended with some dyspnœa and noisy breathing; and the affected cord does not move during breathing, but remains near the median line.

In some cases both sets of muscles are involved, there being a combination of the symptoms and signs described above, which is usually the case in connection with pressure on the recurrent nerves. In rare instances only a single muscle is paralyzed, and then the voice may merely be somewhat altered, being mono-toned, or some notes not being capable of production.

General Diagnosis, Prognosis, and Treatment of Chronic Laryngeal Affections.

Diagnosis.—When symptoms indicate the existence of some chronic disorder in connection with the larynx, the diagnosis has to be made between:—1. Mere functional disturbance. 2. Pressure or irritation, either affecting the air-tube directly; or its nerves. 3. Organic disease, of which, if present, it is requisite to determine as accurately as possible the nature, seat, and extent. The chief points to be taken into consideration are:—*a.* The personal and family history of the patient, as revealing any constitutional diathesis. *b.* The existing evidence of constitutional disease, especially phthisis, syphilis, or cancer; or of a hysterical condition. *c.* The exact local symptoms present, particularly as regards respiration and voice. *d.* The conditions revealed on careful examination of the chest, those to be specially looked for being phthisical disease of the lungs; and morbid conditions which might directly affect the windpipe or its nerves. *e.* The results of laryngoscopic examination. Of course it is only by the efficient employment of the laryngoscope that positive and accurate information can be obtained.

Prognosis.—All *organic* laryngeal affections are troublesome, and some of them highly dangerous, especially extensive ulceration; great thickening of tissues; destruction of the cartilages; and the existence of certain morbid growths, or of such as cannot be removed. The danger is in proportion to the degree of interference with breathing; and the liability to spasm. In many cases there is no fear of a fatal result, but the prognosis as regards the restoration of the functions of the larynx is unfavourable. Much will depend upon the constitutional condition. Syphilitic disease may often be rapidly cured under proper treatment. Laryngeal phthisis is very serious and intractable as a rule. Cancer is necessarily fatal.

With respect to the *functional* disorders, paralysis of the adductors is favourable usually; that of the abductors very unfavourable, the patient being in great danger. The cause of the paralysis will necessarily influence the prognosis.

TREATMENT,—Rest to the larynx, as far as possible; residence in a dry atmosphere, of warm and uniform temperature; the removal of all causes of local irritation; the stoppage of any injurious habit, such as excessive smoking; and the wearing of sufficient warm clothing over the neck and chest, are the principal *general* matters requiring attention in the treatment of any organic laryngeal disease. In some cases a change of climate is imperative, if it can be obtained; but, if not, a respirator should be worn, at the same time damp, cold, and especially night air being avoided.

Constitutional treatment is often of great importance, especially for syphilitic and phthisical affections. In many cases of chronic laryngitis tonics are useful; or treatment directed to the alimentary canal may be called for. Various German waters and those of the Pyrenees are recommended in obstinate cases. Sometimes deglutition is much affected, owing to the condition of the epiglottis, especially in laryngeal phthisis, and then particular attention is required as regards the feeding of the patient, care being taken that a sufficient quantity of nutriment is consumed. It is useful in these cases to thicken liquids with corn-flour or arrow-root. Sometimes the food must be administered through an œsophageal tube, or by enema.

Local treatment is, however, in most cases that requiring the chief attention in laryngeal diseases. Remedies are best applied by means of a camel's hair brush attached to a bent handle; by inhalation or the spray-inhaler; or by blowing in powders. Lozenges are very useful if the throat is affected at the same time. The applications should be made effectually, regularly, and as frequently as each individual case may require, the laryngoscope-mirror being made use of in order to give sufficient light. The chief substances employed are—1. Mineral astringents and caustics, viz., *nitrate of silver; chloride, sulphate,* or *acetate of zinc; alum* and *chloride of aluminium; perchloride of iron;* or *sulphate of copper.* 2. Vegetable astringents, such as *tannin* or *kino.* 3. Volatile stimulating liquids in inhalations, viz., *creosote, carbolic acid, oil of pine* or *juniper.* 4. Sedatives in inhalations, especially *conium, tincture of benzoin, ether* or *chloroform. Glycerine* is the best solvent when any remedy is applied with the brush. Different applications are required in different cases, but Dr. Morell-Mackenzie finds *chloride of zinc* one of the most useful mineral astringents in chronic laryngitis. *Tannin* is very valuable in phthisis; and *nitrate of silver* in syphilitic ulceration.

As regards morbid growths, these necessarily require removal by operation. *Evulsion* is the chief method of operation usually adopted; but it is useless to enter into any description, as only those who have had considerable practical experience would be likely to undertake its performance. Even cancer may sometimes be removed with temporary benefit. Caustic remedies are of no value, except for the destruction of condylomata. The *galvanic cautery* has been employed in the treatment of laryngeal growths.

Not uncommonly *tracheotomy* is called for, in order to prevent suffocation, in cases of extensive ulceration, morbid growths, or great thickening and contraction of the larynx, and the results are sometimes very satisfactory. Subsequently it may be desirable to remove a growth by dividing the thyroid cartilage.

In all cases where there is a liability to laryngeal disease, every precaution must be taken to guard against its development. In phthisis the least indication of any laryngeal irritation should receive prompt attention.

For laryngeal *functional* disorders general treatment is often indicated. All obvious causes of irritation must be removed, if possible. Local faradization is the great remedy in paralysis of the adductors, one pole being placed over the thyroid or cricoid cartilage, and the other in contact with the vocal cords. Paralysis of the abductors usually demands the performance of tracheotomy, in order to avert suffocation.

CHAPTER VII.

DISEASES OF THE BRONCHI.

1. ACUTE BRONCHIAL CATARRH. ACUTE CATARRHAL BRONCHITIS.

ÆTIOLOGY.—*Predisposing causes.* These are:—Early or advanced age; indulgence in relaxing and enervating habits; immoderate clothing of children; debility from any cause; the presence of some constitutional disease, *e.g.*, rickets, tuberculosis, gout; chronic pulmonary affections, or previous attacks of bronchitis; cardiac diseases or other conditions which induce overloading of the bronchial vessels; a cold and damp climate or season, especially if liable to sudden changes of temperature; occupations involving exposure, rapid changes in temperature, or the breathing of irritating particles; and residence in the poorer and unhealthy districts of large towns.

Exciting causes. 1. In the great majority of cases bronchitis results from *taking cold* in some way or other, such as by exposure to cold and wet, sitting in a draught when perspiring, sudden change in temperature, wearing damp or insufficient clothing, or sleeping in a damp bed. Undoubtedly many children suffer in consequence of the legs and lower parts of the body being so often left unprotected. 2. *Direct irritation* of the bronchial mucous membrane is another frequent cause, set up by very hot or cold air; irritant gases; mechanical particles in the inspired air, such as, cotton, wool, dust, steel; blood; irritating secretions; or morbid growths, *e.g.*, tubercle and cancer. 3. *Blood-poisoning* may induce bronchial catarrh, as in various fevers, especially typhoid and measles; in gout, rheumatism, or syphilis; after the sudden disappearance of acute or chronic skin affections, or the suppression of habitual discharges; or during the administration of certain medicines, especially iodine. 4. Bronchitis occurs as an *epidemic*, associated with influenza.

ANATOMICAL CHARACTERS.—The morbid appearances directly indicating bronchial catarrh include redness, varying in its hue and arrangement; swelling, opacity, relaxation, and diminution in consistence of the mucous membrane; at first dryness of the surface, soon followed, however, by excessive secretion, which changes in its characters as the case progresses, consisting at first of clear frothy mucus, but afterwards becoming more opaque and viscid, muco-purulent or purulent, owing to the abundance of cells; and often epithelial abrasions, or even slight ulcerations. Occasionally blood is present in the tubes; or fibrinous particles or casts may be visible.

The appearances will necessarily vary considerably according to the extent, severity, and stage of the disease. The redness is most marked towards the upper part of the lungs, and at the bifurcations of the bronchi, but is rarely perceptible beyond their fourth or fifth divisions, and it may disappear after death, owing to the contraction of the muscular and elastic fibres. The inflammatory products are most abundant towards the bases, and in the dependent parts of the lungs; by their accumulation in the air-cells and minute bronchi they sometimes give rise to yellow spots near the surface, especially in children. Both lungs are usually affected, but to an unequal degree.

As complications associated with bronchitis the chief conditions observed are pulmonary congestion and œdema; lobular or more extensive collapse; acute emphysema or insufflation; lobular or rarely lobar pneumonia; and pleurisy. The venous portion of the circulation is over-loaded with dark blood. The bronchial glands are often red, soft, and enlarged.

SYMPTOMS.—It will be necessary to allude to certain varieties which acute bronchitis presents in its clinical history, but in a general way the *local* symptoms may be summed up as:—Unpleasant or painful sensations in the chest; interference with breathing; and cough, with expectoration of the materials formed in the tubes. More or less pyrexia is almost always present; while in some cases there is a tendency to suffocation, from blocking up of the bronchial tubes; in others to adynamic symptoms.

1. PRIMARY OR IDIOPATHIC BRONCHITIS.— *a. Involving the larger and medium-sized tubes.* When due to a cold, acute bronchitis is usually ushered in by coryza, sore-throat, and some degree of hoarseness; chilliness or slight shiverings, alternating with a sense of heat; general pains and languor; drowsiness with restlessness; furred tongue, anorexia, and constipation. Occasionally slight delirium is observed; or in very young and weakly children convulsions may occur. The symptoms of the established disease are *local* and *general.*

Local. Subjective sensations of heat, burning, rawness, soreness, tickling, or actual pain are experienced to a greater or less degree over the front of the chest, but especially behind the upper part of the sternum, and in the supra-sternal notch. These are increased by a full inspiration, and the act of coughing often gives rise to much tearing pain. There may be tenderness over the sternum. Muscular pains are common as the result of cough, especially towards the sides and base of the thorax. A sense of oppression, weight, or tightness in the chest is felt; and respiration may be somewhat hurried and laborious, but there is no evident dyspnœa. Cough is a prominent symptom, being due at first to the irritable condition of the lining membrane, and subsequently to the secretions formed in the tubes. It is paroxysmal in character, often irrepressible and violent, especially on lying down and on waking up in the morning. Expectoration soon occurs, the sputa consisting at first of a little clear, thin, frothy mucus; but afterwards increasing in quantity, and becoming muco-purulent, more or less opaque, viscid, and scarcely at all aërated. Sometimes they are very tenacious, and adhesive or ropy, and may form distinct "nummulated" masses. As they alter in their characters, they are more easily expelled. Occasionally the expectoration is streaked with blood. Under the microscope epithelial cells, numerous young cells, exudation- and pus-corpuscles are the chief elements observed, along with abundant granular and molecular matter; sometimes a few blood-discs, fibrinous coagula, or crystals are visible.

General. If the bronchitis is at all extensive, a certain degree of pyrexia is present, but it is never very marked. The patient frequently feels very languid and weak. Other mucous surfaces are often the seat of catarrh along with that of the bronchi.

b. Bronchitis extending into the minute tubes.—Capillary Bronchitis. In most cases this form is but an extension of that already described, being preceded by its symptoms, but sometimes the smaller tubes seem to be affected at the same time as the larger, or quite independently, and then well-marked rigors may occur at the outset, with headache and vomiting. The peculiar features of capillary bronchitis are as follows:—1. Pain is often slight or absent, except the muscular pains resulting from cough, which are very severe. 2. Breathing is always greatly disturbed, being accelerated sometimes to 50 or more per minute; it is wheezing or crepitous in character; attended with effort, and with a considerable sense of want of air. The pulse-respiration ratio is altered, being in some instances about 2·5 to 1. Urgent dyspnœa is observed in severe cases, either constant or paroxysmal, which may amount to orthopnœa. 3. Cough is exceedingly frequent and violent, and during the act patients often sit up or bend forward, and hold their sides. 4. Expectoration is very difficult, the sputa being abundant, as well as usually viscid and tenacious, containing also minute fibrinous casts of the tubes. 5. The general symptoms are of an aggravated character, there being at first considerable fever, the temperature occasionally rising to 103° or more, with much exhaustion and weakness. The urine sometimes contains a little albumen, or a trace of sugar. As the case advances, the tendency is to the development of the usual symptoms indicating suffocation and venous congestion, usually gradual in their onset, occasionally rapid or sudden, owing to the speedy filling-up of the tubes, the cough diminishing, the breathing becoming shallow, and the expired air cool. In some instances, however, typhoid symptoms set in; or there may be a combination of both classes of phenomena.

It is necessary to allude to certain individual peculiarities. Children are very liable to show signs of deficient blood-aëration, even in the slighter forms of bronchitis, especially if they are feeble and badly nourished or rickety, because they cannot expel the sputa. They usually swallow any materials coughed up and, therefore, in order to examine the expectoration it is necessary to wipe the base of the tongue with a handkerchief after a cough. Healthy adults do not suffer nearly so severely as a rule. In aged persons, or in those who are constitutionally weak from any cause, the fever is very apt to assume an adynamic type, even though the bronchitis is not extensive. The term *peripneumonia notha*, formerly much employed, properly includes cases of capillary bronchitis occurring in old or weak subjects after some chronic malady, attended with febrile symptoms at first, signs of adynamia and deficient aëration of blood setting in, however, at an early period.

2. SECONDARY BRONCHITIS.—This term is applied to bronchitis occurring in connection with the exanthemata; in the course of blood-diseases, *e.g.*, gout, rheumatism, Bright's disease; or in cases of chronic lung or heart affections. In nearly all these conditions the complaint is apt to come on very insidiously, without any of the usual symptoms being at all prominent, and it is often a dangerous complication. The expectoration is said sometimes to contain peculiar materials which accumulate in the blood, for instance, uric acid in cases of gout. Pulmonary deposits usually give rise to localized bronchitis. When acute bronchitis complicates emphysema and chronic bronchial catarrh, especially if associated with cardiac disease, urgent dyspnœa and signs of apnœa are likely to set in speedily, accompanied with general venous congestion and dropsy; expectoration is also very abundant and frothy at first in these cases.

3. MECHANICAL BRONCHITIS.—When due to the inhalation of irritant particles, the attacks of bronchitis are of frequent occurrence, but comparatively slight, there being no pain or fever, the chief symptom being an irritable cough with but little expectoration, which may contain some of the particles breathed.

4. EPIDEMIC BRONCHITIS has been already sufficiently described in connection with influenza.

It must be remembered that the complications previously mentioned may be present, modifying the symptoms as well as the physical signs, which are now to be considered.

PHYSICAL SIGNS.—1. The chest may be somewhat *enlarged*, from insufflation of the lungs. 2. *Respiratory movements* are more or less quick, frequent, and deep; expiration is sometimes prolonged; and if the tubes are extensively filled, the upper part of the chest moves unduly. In children signs of *inspiratory dyspnœa* are very common.

3. *Rhonchal fremitus* is frequently present, varying in its characters. 4. *Percussion* may reveal increase in extent and degree of pulmonary resonance, on account of distension of the lungs; or occasionally some deficiency of resonance at the bases is observed, due to accumulation of secretion, congestion, and œdema or collapse. In infants a sound resembling the crack-pot sound may be frequently elicited. 5. *Respiratory sounds* are loud and harsh, with prolonged expiration, where the tubes are free; where these are obstructed, they are weak or absent, or may be completely obscured by rhonchi. 6. The various *rhonchal sounds*, due to the narrowing of the tubes, or to the fluids contained within them, constitute the most important physical signs of bronchitis. They may be of sonorous, sibilant, mucous, submucous, or subcrepitant character, according to the exact physical conditions present, and these adventitious sounds often co-exist in different parts of the chest. At first the dry rhonchi are only or chiefly heard; while the moist râles are principally observed towards the bases of the lungs. When fluids collect in the larger tubes, rhonchal sounds may be audible at a distance from the patient. Cough affects them considerably. Occasionally the heart's action may originate râles in neighbouring tubes.

Duration and Terminations. According to its severity, a case of bronchitis may end in three or four days, or go on for two or three weeks or more. Capillary bronchitis generally proves fatal from the sixth to the twelfth day, death occurring earlier in children than in adults as a rule. There is always the danger of a relapse, or of extension of the inflammation. The *terminations* are:—*a*. In recovery, but in severe cases convalescence may be very prolonged, and cough is liable to remain for some time. *b*. In death, either from gradual or sudden apnœa; or from adynamia. *c*. Occasionally by transition into the chronic state. As *sequelæ*, emphysema, pulmonary collapse, deformed thorax in children, or acute or chronic phthisis may remain.

Diagnosis.—The diagnosis of the diseases of the lungs will be hereafter considered in a separate chapter. At present it need only be remarked that the chief diseases from which acute bronchitis requires to be distinguished are hooping-cough; croup and other forms of laryngitis; pneumonia, especially lobular; and acute phthisis. It is of importance to recognize any complication occurring during the course of an attack; and also not to mistake bronchitis associated with one of the exanthemata for the sole complaint.

Prognosis.—Bronchitis is often a very dangerous disease, and stands high as a cause of death in this country. The circumstances which increase its gravity are:—Very early or advanced age; a bad state of health, or the existence of some chronic or acute disease of a general character; previous organic mischief in the lungs, especially extensive emphysema; the existence of disease of the heart; extensive implication of the smaller tubes, with great difficulty of expectoration; signs of accumulation of materials in the tubes, with shallow breathing and cessation of cough, or of their extensive obstruction, the latter to be especially looked for in children; urgent dyspnœa, with evidences of apnœa; the presence of adynamic symptoms; the occurrence of complications; neglect of treatment; and a low epidemic type.

TREATMENT.—Early attention is required in all cases of bronchitis, but especially when children are affected. Confinement to the house or even to one room is advisable; and if the case is at all severe, the patient should remain in bed, warmly clad in flannel, avoiding exposure of the chest, the room being kept at a temperature of from 65° to 68°, and it may be necessary to moisten the air by means of steam. When the attack results from a cold, it is useful at the outset to induce free perspiration by means of copious hot drinks, aided by a warm foot-bath, to which may be added a little mustard, or even a hot-air, vapour, or Turkish bath, the patient then going to bed, and lying between blankets, covered with abundant bedclothes. A full dose of *Dover's powder* may be given, or a saline diaphoretic draught. A sinapism over the chest is useful; and if the larynx is at all involved, steam inhalations should be employed. An emetic at the outset is in much favour with some practitioners in severe cases, and might occasionally be serviceable in the treatment of children.

Should the symptoms not subside, the indications are:—1. To subdue the inflammation as soon as possible. 2. To promote the discharge of the materials forming in the tubes, and to diminish their quantity if they are excessive. 3. To relieve unnecessary cough. 4. To allay spasm of the bronchial tubes, if present. 5. To pay attention to the constitutional condition, and to support the strength if it fails. 6. To treat apnœa, excessive fever, or adynamia, should either of these conditions set in. 7. To attend to complications.

For the purpose of fulfilling the first indication, general or local bleeding, and the administration of *tartar emetic*, *tincture of digitalis*, or *tincture of aconite* are the chief measures advocated. Venesection is very rarely required or admissible, but moderate local bleeding, by means of leeches or cupping, may be occasionally beneficial, though much discrimination is necessary in adopting this measure. The front of the chest, and the posterior base are the sites from which blood may be taken with most advantage. The application of two or three leeches sometimes proves highly efficient in relieving severe dyspnœa in plethoric children.

Tartar emetic is decidedly valuable in the early stage of severe cases of bronchitis, provided the patient is strong, and not too old. It may be given with *liquor ammoniæ acetatis* and a few drops of *compound tincture of camphor*, in doses of gr. ¼ to ½ for an adult. *Tincture of digitalis* and *tincture of aconite* have been well spoken of, and are deserving of more extended trial.

The next three indications are carried out mainly by the administration, in various combinations as they are required, of:—*a.* Expectorants, viz., at first *vinum ipecac.*, *tincture* or *syrup of squills*, *compound tincture of camphor;* and later on *carbonate of ammonia*, *chloride of ammonium*, *infusion of senega* or *serpentary*, *ammoniacum*, *galbanum*, or *tincture of benzoin*. *b.* Sedatives and narcotics, especially *opium* or *morphia*, *henbane*, *conium*, *hydrocyanic acid*, or *chlorodyne*. *c.* Antispasmodics, such as the various *ethers*, *tincture of lobelia*, or *spirits of chloroform*.

Each case of acute bronchitis must be studied carefully, and the remedies varied according to its requirements. They may be combined with demulcents or diaphoretics. Should the tubes be much loaded, and expectoration be difficult, narcotics, particularly *opium*, must be avoided, and the patient should lie with the head high, and should be encouraged to cough frequently, not being allowed to sleep for too long a time. It is especially necessary to attend to these matters in the treatment of children. Should there be indications of dangerous accumulation, an emetic of *sulphate of zinc* is very useful. On the other hand, if there is an irritable cough, it may often be voluntarily repressed by the patient, and sedatives are then most valuable. Inhalations are frequently beneficial, those of *conium*, *ether*, *chloroform*, *hop*, or *benzoin*, for the purpose of relieving cough and checking spasm; later on those of *tar*, *creosote*, or *carbolic acid*, to diminish or improve the sputa.

Local treatment is generally called for. Repeated sinapisms, hot or turpentine fomentations, and linseed-meal poultices over the chest are beneficial at first. When the acute symptoms have subsided, blistering may be useful; or, if there is a tendency to chronic catarrh, some more powerful application may be required, turpentine or croton-oil liniment being the most efficacious. Free dry-cupping frequently relieves troublesome dyspnœa and oppression about the chest, especially when acute bronchitis complicates emphysema with chronic bronchial catarrh. In these cases flying blisters and turpentine stupes are also very serviceable.

The constitutional conditions chiefly requiring attention in cases of bronchitis are general debility, rickets, tuberculosis, and gout. Lowering treatment is not borne when either of these is present. It is quite needless to keep patients on too low a diet, and considerable support is often called for in bad cases. Stimulants are not requisite as a rule, and may do harm, but they must be given if necessary, particularly if signs of adynamia or apnœa set in, their effects being carefully watched. Excessive pyrexia calls for full doses of *quinine*. Any tendency to asphyxia must be combated by the usual measures.

In the treatment of children, one of the best remedies in most cases is *ipecacuanha wine* in moderate doses, repeated every three or four hours. When bronchitis attacks old people or those who are enfeebled from any cause, or when it occurs as a secondary complication, wine or brandy and abundant nourishment are usually required, and a mixture should be given containing *carbonate* or *muriate of ammonia*, *ether* or *spirits of chloroform*, and *tincture of squills*, with *camphor mixture*, *decoction of bark*, *infusion of senega*, or *ammoniacum mixture*. Capillary bronchitis in the majority of cases demands a stimulant and supporting treatment.

Proper precautions must be taken until convalescence is thoroughly established, especially against cold, damp, and night air; while flannel should be worn next the skin. Tonics are often useful during recovery, such as *quinine*, *mineral acids*, or *iron*. Due care must also be exercised in the case of those who are subject to bronchitis, and for such persons a change to some genial climate during the winter season is very desirable.

II. Chronic Bronchitis—Chronic Bronchial Catarrh.

Ætiology.—As a rule chronic bronchitis follows repeated attacks of the acute disease, but occasionally it remains after one attack, or begins as a chronic affection. It is frequently associated with gout and other constitutional complaints, chronic lung-diseases, heart-affections causing pulmonary congestion, or chronic alcoholism; or it results from breathing irritant particles. Persons advanced in years are by far most subject to chronic bronchial catarrh, but even children are liable to suffer.

Anatomical Characters.—When this complaint has been long-established, it leads to considerable changes in the bronchial tubes. Their lining membrane becomes dark-coloured, often of a venous hue, or here and there greyish or brownish; and the capillaries are visibly enlarged and varicose. Thickening of tissues, increased firmness, amounting in some instances to marked induration, and contraction of the tubes are observed, with loss of elasticity, and muscular hypertrophy. The cartilages may ultimately calcify. The small tubes are narrowed or closed up; the larger being often dilated, and gaping on section. The surface of the mucous lining is uneven, frequently presenting extensive epithelial abrasions, or occasionally follicular ulcers. In some cases there is only a little tenacious mucus in the tubes, but usually they contain abundant muco-purulent or purulent matter, or frothy mucus.

Symptoms.— Cases of chronic bronchitis present much variety as regards the severity and exact characters of their symptoms, depending upon the extent of the affection: and upon its frequent association with other morbid conditions in the lungs, especially emphysema, dilated bronchi, or phthisis; with cardiac affections; or with some constitutional diathesis. They may, however, be conveniently classed under three groups:—

1. In many instances patients only suffer during the cold season, having a winter-cough; but after a while the symptoms often become permanent to a greater or less degree, being liable to exacerbations in cold and damp weather. A little uneasiness or soreness may be felt behind the sternum, increased by coughing; and a a sense of oppression across the chest, with shortness of breath on exertion, is usually experienced in severe cases. Cough is the main symptom, occurring chiefly in paroxysms, varying greatly in severity and frequency; it is often very annoying on first going to bed, and early in the morning. The cough is attended with expectoration, the sputa being frequently abundant and difficult to expel; and consisting of greyish mucus, yellowish or greenish muco-purulent or purulent matter, or a mixture of these materials, usually running into one mass, but occasionally remaining in separate lumps, which may be nummulated. Being but slightly aërated, the masses not infrequently sink in water. Occasionally blood-streaks are observed. Sometimes a most offensive or even gangrenous odour is given off, supposed to be due to decomposition of the sputa, or to the presence of microscopic sloughs. The microscope reveals much

granular matter, with imperfect epithelial and pus-cells, and often blood-corpuscles.

Severe cases may be attended with considerable wasting and debility; as well as with slight evening pyrexia and night-sweats.

2. *Dry catarrh—Dry bronchial irritation.*—This variety is particularly observed in connection with gout or emphysema; as a result of irritant inhalations; and in sea-side places. More or less dyspnœa is experienced, with a sense of tightness across the chest and wheezing; and very distressing paroxysms of irritable cough come on, either quite dry, or only followed by the expectoration of a small pellet of greyish, pearl-like, tough mucus, compared to boiled starch, or of a little watery fluid.

3. *Bronchorrhœa.* Most frequent in old people, especially in connection with cardiac diseases, this form is characterized by the expectoration being very abundant, sometimes amounting to as much as four or five pints in the twenty-four hours: in character being either watery and transparent, or glutinous and ropy, resembling a mixture of white of egg and water, and scarcely at all frothy. The cough is paroxysmal and often violent, but may be insignificant compared with the quantity of fluid discharged. Patients frequently obtain relief from dyspnœa and other unpleasant sensations after a spell of coughing. In severe cases there may be loss of flesh, and proportionate weakness.

PHYSICAL SIGNS.—The only signs directly due to chronic bronchial catarrh are:—1. *Rhonchal fremitus.* 2. *Harsh respiratory sounds*, with prolonged expiration. 3. *Sonorous* and *sibilant* rhonchi with large *mucous* râles towards the bases, the latter being rarely abundant, and varying in characters according to the consistence of the contents of the tubes. Other signs are generally present in cases of long duration, but they are dependent upon emphysema and other morbid changes accompanying the catarrh.

PROGNOSIS.—When chronic bronchitis is confirmed, only rarely can the complaint be thoroughly cured. In less advanced cases, however, complete restoration may be effected if due precautions are exercised. Patients suffering from chronic bronchitis often live to a good old age, but lead an uncomfortable existence. The chief dangers to which they are liable are that the disease should become more extensive, or should induce emphysema, dilated bronchi, collapse, or phthisis; or that an acute attack might supervene, which is frequently highly dangerous.

TREATMENT.—From what has just been stated, it is obvious that all cases of chronic bronchitis ought to be thoroughly attended to at as early a period as possible. The patient must be removed from every source of irritation, and must observe due precautions against exposure, wearing warm clothing with flannel next the skin; if a suitable climate cannot be obtained, it will be well for the patient to keep indoors during bad weather, or if obliged to go out, a respirator should be worn.

It is very important to look to the state of the heart, of the digestive organs, and of the general system. If cardiac disease is present, *infusion* or *tincture of digitalis* is often very useful. By relieving dyspeptic symptoms, and keeping the bowels freely open, much good may also frequently be effected. Any constitutional diathesis present must be attended to, especially gout, rheumatism, rickets, or tuberculosis; and a plethoric or anæmic state of the blood should be corrected. A great many cases of chronic bronchitis do well under a course of treatment by tonics and good diet, with some stimulant, especially if there is abundant expectoration, causing debility and wasting. *Quinine*, preparations of *iron*, or *mineral acids* with *bitter infusions* are often very valuable, as well as *cod-liver oil.* In some cases mineral nervine tonics, such as *sulphate* or *oxide of zinc*, are beneficial.

Much discrimination is requisite in the employment of remedies which have a local action. The main indications are to limit excessive secretion; to assist expectoration, should the act be difficult; to allay irritable cough; and to subdue spasm of the bronchial muscular fibres. The first indication is carried out by the internal administration of *chloride of ammonium;* of *balsams* and *resins*, especially *balsam copaibæ*, *ammoniacum*, or *galbanum;* or of astringent preparations of *iron*, *acetate of lead*, *mineral acids*, *tannic* or *gallic acid;* and by employing inhalations of steam impregnated with *tar*, *creosote*, *carbolic acid*, or *naphtha;* or very dilute dry inhalations of *iodine*, *chlorine*, *balsamic* and *resinous* vapours, or the vapour of *chloride of ammonium.* The other indications are fulfilled by means similar to those mentioned under acute bronchitis, and similar precautions must be observed in the use of narcotics, should there be a tendency to accumulation of secretion. If the sputa are very viscid, *alkaline carbonates* or *liquor potassæ* may prove beneficial. Sedative inhalations are most valuable should there be much irritable cough. *Tincture of Indian hemp* is sometimes useful when there is much tendency to spasm.

The chest should be covered in front with some warm plaster, and with cotton wool. Free dry-cupping, sinapisms, blisters, turpentine liniment, croton oil liniment, and other local applications are frequently serviceable.

Change of climate or a sea voyage proves most beneficial in many cases. All forms of bronchitis require a tolerably warm region, which is not subject to rapid changes of temperature, or exposed to cold winds, and which is situated at a moderate elevation. Dry catarrh needs a soft and relaxing atmosphere, of moderately high temperature. If there is much expectoration, a dry, warm, and more or less stimulating atmosphere answers best. Torquay, Penzance, Bournemouth, Grange, Clifton, and Tunbridge Wells in this conntry; and Mentone, San Remo, Pisa, Rome, Cannes, Algiers, and Corfu in foreign countries, are the chief places available for patients suffering from chronic bronchitis.

III. Plastic or Croupous Bronchitis.

Ætiology.—Young adults suffer most frequently from this rare complaint, and it is rather more common among females. It is supposed to be due to some diathetic condition, and is said to be generally associated with a weak constitution, or sometimes with tuberculosis. The affection may, however, certainly be met with in strong and apparently healthy persons.

Anatomical Characters.—A plastic exudation collects in the and tubes, forming whitish casts, varying in size according to the tubes affected, as well as in extent; being either hollow or solid; sometimes presenting concentric layers. It consists of an amorphous or fibrillated substance, enclosing granular matter, oil-globules, and cells, some of which are nucleated. Some suppose that the material is merely altered blood, the result of bronchial hæmorrhage, but this is not correct.

Symptoms.—Plastic bronchitis is almost always chronic in its course, but presents acute exacerbations. The affection is characterized by fits of cough and dyspnœa, more or less frequent, severe, and prolonged, being sometimes extremely aggravated; followed and usually relieved by the expectoration of fibrinous masses, which on being unravelled under water exhibit tree-like casts of the tubes. There may be more or less hæmoptysis. Sometimes extensive bronchial catarrh or pneumonia is set up; and considerable pyrexia may be observed. In the intervals patients suffering from this complaint often feel perfectly well.

The *physical signs* indicate obstruction of the tubes, more or less complete and extensive, leading to emphysema or collapse. *Dry* rhonchi are often audible on auscultation, especially those of a *sibilant* character, with a few *mucous* râles.

A case came under my notice, in which a tolerably healthy-looking young man was affected with plastic bronchitis, bringing up a quantity of casts almost daily, but who scarcely suffered any inconvenience.

Treatment.—During the attacks of dyspnœa and cough the use of inhalations; the external application of sinapisms, turpentine fomentations, or a blister to the chest; and the internal administration of sedatives, with *tartar emetic* or *ipecacuanha wine*, might be tried. For the cure of the complaint there is no known remedy. Tonics, *cod-liver oil*, change to a warm climate, or a long sea-voyage seem to be most beneficial. *Tartar emetic*, *iodide of potassium*, *alkalis* and their *carbonates*, *mercury*, inhalations of *iodine*, and various other remedies have been tried, but usually without success.

IV. Dilatation of the Bronchi. Bronchiectasis.

Ætiology.—Bronchiectasis generally arises in the course of some chronic lung-disease, especially bronchitis, phthisis, and chronic interstitial pneumonia. Its immediate causes are supposed to be:—1. *Morbid changes* in the walls of the bronchi, diminishing their resisting power. 2. *Increased pressure of air* from within, either during cough in parts unsupported; or during inspiration, in consequence of obliteration of a number of air-vesicles, the dilatation of the bronchi being then compensatory. 3. Persistent *pressure of stagnant secretion.* 4. *Contraction of lung-tissue,* in connection with chronic interstitial pneumonia, the enclosed bronchi becoming dilated in the process.

Anatomical Characters.—The bronchi may be extensively dilated, and of a fusiform shape; or they present one or more limited globular enlargements. Their size varies considerably. After a time their inner surface becomes irregular, and occasionally ulcerated; they contain a muco-purulent or purulent substance, which is often fœtid; and they are sometimes the seat of gangrene or hæmorrhage. Their contents may ultimately dry up, becoming caseous or even calcareous; and finally the dilated tubes may become obliterated.

Symptoms.—The only significant symptom of dilated bronchi is the occurrence of severe paroxysms of cough, ending with abundant expectoration, which is discharged with much difficulty, depositing a thick sediment on standing, and being often exceedingly fœtid, also containing caseous particles.

Physical Signs.—The signs of bronchiectasis are:—1. Tubular *percussion-sound* occasionally. 2. Loud bronchial, blowing, tubular, or cavernous *breath-sound,* which may be heard after a cough when previously absent. 3. Various *moist* râles, which may be of hollow character. 4. Loud *bronchophony* or *pectoriloquy.*

Treatment.—The chief matter requiring attention is to see that the secretions are not allowed to stagnate in the dilated bronchi, the patient being encouraged to cough, and expectoration being assisted. The sputa may be improved and limited in their amount by means of inhalations of *carbolic acid* or *creosote.*

Chapter VIII.

PULMONARY CONGESTION—ŒDEMA—HÆMORRHAGE.

These morbid conditions may be considered together, as they are in many instances but stages of the same process.

Ætiology.—Hyperæmia of the lung may be *active, mechanical,* or *passive. Active* congestion results from:—1. *Increased cardiac action* from any cause. 2. Probably *hypertrophy of the right ventricle* sometimes. 3. *Irritation* set up by certain conditions of the air inspired, or by deposits in the lungs. 4. Various pulmonary affections which *interfere with the capillary circulation* in some parts of the lungs, in consequence of which the vessels of other parts become overloaded. 5. *Inflammatory* pulmonary diseases, of which congestion is the first stage, and which it often accompanies. 6. *Obstruction to the entrance of air* into the lungs during inspiration, and hence rarefaction of the residual air, with diminished pressure on the vessels. The causes of *mechanical* hyperæmia are:—1. Some *cardiac disease* in the great majority of cases, interfering with the passage of blood through the left cavities of the heart, especially mitral disease, but probably also a feeble and dilated condition of the left ventricle. 2. Very rarely a *tumour pressing on the pulmonary veins*. *Passive* congestion is most frequently observed in connection with low fevers and other conditions which greatly depress the action of the heart, and disturb the capillary circulation, especially in aged and feeble individuals; it is seen chiefly in dependent parts, usually the bases and posterior portions of the lungs, on account of the influence of gravitation, and the congestion is then termed *hypostatic*. Probably it may also arise in connection with a very weak dilated right ventricle.

Pulmonary œdema is as a rule the result of long-continued or intense congestion from any cause, but especially when this is associated with cardiac disease. It may be but a part of a general dropsy.

Hæmorrhage into the lungs may occur under the following circumstances:—1. As a result of congestion. 2. From the lodgment of an embolus in one of the branches of the pulmonary artery. This embolus is usually associated with cardiac disease, and is detached from a clot in the right ventricle, but it may be conveyed from more distant parts. 3. From a diseased condition of the branches of the pulmonary artery. This often materially aids in the causation of pulmonary hæmorrhage. 4. As a consequence of injury to the lungs or chest. 5. In connection with morbid growths, cavities, or ulceration in the lungs. 6. Owing to some morbid condition of the blood, such as that associated with scurvy, purpura, or malignant fevers.

ANATOMICAL CHARACTERS.—Hyperæmia of the lung gives rise to a more or less deep-red colour, which may become bluish, purple, livid, or blackish-red. The part affected is enlarged, relaxed, and moist; crepitates imperfectly; and a quantity of aërated bloody fluid escapes from its tissue on section. Pieces float in water. In extreme cases the vesicular structure is scarcely apparent, and the tissue breaks down very readily, this condition of the lung being termed *splenification*. Hypostatic congestion may end in hypostatic pneumonia.

Œdema is necessarily chiefly observed in dependent parts, and is always present, more or less, when the lungs are congested. The lungs are enlarged, tense, and do not collapse when the chest is opened; while they have a peculiar feel, retaining the impression of the finger for a time. The tissues are very moist, and on section a large quantity of serous fluid escapes, either red or colourless according as the œdema is associated with congestion or not, and it may or may not be frothy. The lungs are either congested or pale and anæmic.

Hæmorrhage is described as occurring under four forms, viz.:—1. *Circumscribed* or *nodular—hæmorrhagic infarction* or *pulmonary apoplexy*. 2. *Diffuse* or *true pulmonary hæmorrhage*. 3. *Interlobular*. 4.

Petechial, in connection with blood-diseases. The last two are very rare, and do not call for further notice.

Hæmorrhagic infarction is due to embolism, and the blood comes from the capillaries of the pulmonary artery, collecting within, as well as outside the alveoli and minute bronchi, but there is no laceration of tissue. The size of an accumulation varies considerably, depending upon that of the branch of artery obstructed, and it may measure from half an inch to 4 inches or more in diameter. When situated in the interior of the lung, the infarction is large; when near the surface it is small and wedge-shaped or pyramidal, with the base projecting outwards a little beyond the surface. The most frequent seats of infarction are the interior of the lower lobe, and the vicinity of the root of the lung, but at the same time there may be others more superficial, and they are often numerous. Each hæmorrhage is circumscribed and defined, and it may only correspond to a single lobule, but the surrounding tissue is congested and œdematous. The infarctions feel very firm and hard; a section presents a solid, airless, slightly-granulated, dark-red or blackish appearance; while coagulated blood can often be scraped away, and then the lung-structure may become perceptible.

Apoplectic clots in the lungs are liable to the usual changes, and the blood may ultimately be completely removed, the tissues being restored to their normal condition. In many cases a permanent blackish, pigmented knot is left. Pneumonia is sometimes excited, or an abscess may form, the clot softening in the centre; or it may undergo caseous or calcareous degeneration, and become encapsuled.

In the *diffuse* form of hæmorrhage, a vessel of some size gives way, the lung-tissue being lacerated, and an irregular potential cavity being formed, varying in size, and containing a mixture of fluid and clotted blood. The pleura may give way, the blood consequently escaping into its cavity.

A few remarks may be made here with reference to a condition known as *brown induration of the lung*. This follows long-continued congestion, especially that due to mitral disease, and it is characterized by the accumulation of granular yellowish pigment, probably of the nature of hæmatoidine, in enlarged epithelial and granular cells, which collect in the alveoli; accompanied with varicose dilatation of the capillaries; and probably thickening of the alveolar walls. The pigment may become black, and may finally be found free. The lungs are increased in bulk, and do not collapse; feel heavy, compact, and inelastic; and present a yellowish tint, passing into brown or reddish-brown. On section, in addition to the general change in colour, red spots are seen, shading into black, and a brownish fluid may be expressed. Various degrees of the change are observed, and the extent of tissue affected differs much in different cases, while infarctions are often present at the same time.

SYMPTOMS.—These are not easy to define, as they are usually only exacerbations of previously-existing symptoms. One of the most obvious clinical phenomena resulting from pulmonary congestion and its consequences is dyspnœa, either coming on for the first time, or being more intense than before, and sometimes amounting to orthopnœa. A feeling of tightness or oppression is often experienced across the chest, but pain is generally absent. There is more or less cough, which in pulmonary œdema is attended with very profuse watery expectoration; and when hæmorrhage takes place, more or less blood is usually discharged, which may have a dull-brownish or bister-colour, or be almost black. If a clot excites inflammation, pyrexia and other symptoms indicating this complication will supervene.

Physical Signs.—1. *Respiratory movements* are often diminished. 2. *Percussion-sound* may be at first abnormally clear in pulmonary congestion; but afterwards becomes more or less deficient at the bases. There may be localized dulness in connection with hæmorrhage. 3. *Respiratory sounds* are usually weak and harsh; over the seat of hæmorrhage they may be bronchial. 4. Œdema is characterized by abundant, small, liquid, bubbling *râles;* localized moist râles may also be perceptible over the part of the chest corresponding to pulmonary hæmorrhage, and here signs of pneumonia or abscess may ultimately be set up. 5. *Vocal fremitus* and *resonance* may be increased or diminished, but are quite unreliable.

Prognosis.—As a rule these affections are serious, and they often increase the gravity of the prognosis considerably, because they complicate other dangerous conditions.

Treatment.—Much will depend on the exact nature and extent of the morbid changes; and the conditions which cause them, or with which they are associated. Free dry-cupping of the chest is often very useful, and sometimes local removal of blood is indicated. It is important to attend to position; and to keep the patient at rest. Good diet, tonics, and stimulants are frequently necessary. Care must be taken in cases of œdema that the fluid is not allowed to accumulate in the lungs. In diffuse hæmorrhage astringents are required. Remedies which act upon the heart and vessels may be of much service, especially *digitalis.*

Chapter IX.

PNEUMONIA—INFLAMMATION OF THE LUNGS.

Inflammation of the tissues of the lungs occurs under different forms, each of which requires separate consideration.

I. Acute Croupous Pneumonia. Lobar Pneumonia.

Ætiology.—*Predisposing causes.* 1. *Age.* Most cases occur between 20 and 30 years of age, but no age is exempt, and the young and old are very liable to suffer. 2. *Sex.* More males are attacked, probably from their greater exposure to the exciting causes. 3. *Social position*, *habits*, and *occupation*. Poverty, residence in large towns, intemperance, and occupations involving exposure or over-exertion, predispose to pneumonia. 4. *State of health*. Pneumonia is very liable to occur in those who are constitutionally feeble, or who suffer from any lowering chronic or acute disease; as well as during convalescence from the latter. 5. *Previous attacks* increase the liability to the complaint. 6. *Climate* and *season*. Those characterized by coldness, rapid changes in temperature, much moisture, or the prevalence of northerly and easterly winds, greatly predispose to attacks of pneumonia.

Exciting causes. 1. Most cases of *primary* pneumonia arise from a *cold*, induced by a sudden chill when the body is heated; by exposure to cold or wet; or by a cold draught. 2. *Direct irritation* not unfrequently sets up pneumonia, which irritation may be due to the inhalation of very hot or cold air, or of irritating gases; foreign bodies, such as food; blood, especially apoplectic clots; or morbid formations, for example, tubercle, cancer, diphtheritic or croupous exudation. 3. *Injury* to the chest often excites local inflammation, such as a contusion, fracture of the ribs, or a perforating wound. It has been stated that violent exertion is occasionally a cause of pneumonia, but this is very doubtful. 4. Pneumonia is frequently *secondary* to various acute affections, especially low fevers and blood-diseases, *e.g.*, measles, small-pox, typhus, typhoid, pyæmia, and puerperal fever. It is also very apt to arise in the course of chronic blood-diseases, but in these cases there is some other exciting cause, which may be undiscoverable, acting on a depraved system. 5. *Epidemic* pneumonia has been described. The complaint may assume this character in connection with influenza or other epidemic diseases, especially if there is much over-crowding, with deficient ventilation. It is also said to prevail in malarial districts. 6. Intense or long-continued pulmonary congestion is very liable to cause pneumonia, especially that which results from heart-disease, or the hypostatic congestion which affects dependent parts in old and weak individuals who are confined to bed from any cause—*hypostatic pneumonia*.

Some authorities regard acute primary pneumonia as a *specific fever*, of which the pulmonary inflammation is but a local manifestation.

ANATOMICAL CHARACTERS.—Pneumonia is characterized pathologically by hyperæmia and œdema; followed by the formation of a fibrinous exudation in the interior of the air-vesicles and minute bronchi, which undergoes various changes. It is necessary to describe the appearances presented at different stages.

Dr. Stokes has described a *preliminary stage*, characterized by brilliant arterial redness of the lung-tissue, with abnormal dryness, but no other alterations. Those usually seen, however, are as follows:—

First or *Engorgement stage*. Colour is dark-red, reddish-brown, violet, or livid; not uniform, but mottled. The lung feels heavy; and the affected part is firmer, more resisting, and less elastic than in health, retaining impressions of the finger, and not crepitating much. On section a quantity of reddish or brown bloody serum escapes, which is more or less aërated, and somewhat viscid. The lung-texture is still perceptible, and pieces of the organ float in water. Consistence is diminished, the tissue being more easily torn.

Second or *Exudation stage.—Red hepatization.* Colour is more uniform and dull-reddish. Weight is markedly increased, and the lung is sometimes evidently distended, being marked by the ribs. The affected tissue feels solid and firm, absolutely inelastic, and non-crepitant. A section presents a dull reddish brown colour, with some greyish variegation, and is opaque, but the hue becomes brighter after exposure. Very little fluid escapes, often none except on pressure, this being thick, dirty, sanguineous, and non-aërated. A characteristic granular appearance is usually visible, especially on tearing the affected part, but it is less marked in children, or when the exudation is of soft consistence, as is the case in low fevers, and when the disease attacks old people. All trace of lung-texture has disappeared, and its tissue is very brittle, breaking down easily under pressure. Fragments sink in water instantly. The microscope reveals amorphous fibrin, with abundant newly-formed cells, and some granules.

Third stage.—Grey hepatization. In this stage the colour gradually fades, becoming ultimately grey, combined with a greenish or yellowish tint. The granular appearance on section is less distinct or altogether lost; and the lung-tissue becomes more or less soft or pulpy. A quantity of dirty, greyish, almost puriform fluid escapes, either spontaneously, or on pressure or scraping. This stage presents various grades, from slight softening to what is termed *purulent infiltration.* The changes consist in excessive cell-formation, with fatty degeneration and liquefaction of the inflammatory products. In favourable cases these materials are ultimately either absorbed or expectorated, and the lung-tissue remains unaltered in its structure.

Such being the ordinary course of a case of pneumonia, other pathological *terminations* are observed in rare instances, viz.—1. Formation of one or more abscesses, which either open into the bronchi, the pus being discharged, and a cavity being left; or communicate with the pleura; or become encapsuled, the contents undergoing cheesy or calcareous changes, and, being ultimately completely closed up. 2. Gangrene. 3. Caseous degeneration and destruction of lung-tissue. 4. Chronic induration or cirrhosis.

The *right lower lobe* is the most frequent seat of acute pneumonia, but the inflammation may spread through the entire lung, or may involve both organs. Sometimes it begins in the middle or upper lobe; and in old or cachectic subjects it often extends from above downwards.

The parts of the lungs which are not pneumonic frequently present a congested and œdematous appearance; while more or less bronchitis is present. Pleuritic exudation is commonly observed, but not often abundant effusion. The right cavities of the heart and the general venous system are overloaded, the various organs being congested; and fibrinous coagula are liable to form in the heart and vessels, the blood being exceedingly rich in fibrin, exhibiting the "buffy" coat markedly.

SYMPTOMS.—In some cases an attack of pneumonia is preceded for a short time by *premonitory* symptoms, indicating general indisposition. *Primary* pneumonia usually sets in very suddenly, the invasion being attended with a single, severe, and more or less prolonged rigor. There may be great prostration, with pyrexia; severe vomiting; or nervous symptoms, namely, headache, delirium, restlessness, stupor, or, in children, convulsions. The symptoms of the established disease are *local* and *general*.

Local. Pain in the side is usually complained of, occasionally commencing simultaneously with the rigor, or even preceding it, but as a rule only setting in after a variable interval has elapsed. Its seat is generally about the mammary region; and though considerable in degree, it is not very intense in most cases, at all events for any lengthened period, being tolerably easily relieved. In character it is commonly stabbing or piercing, being increased by a deep breath and by cough. Tenderness is often observed, and sometimes hyperæsthesia of the skin. Dyspnœa is an early and prominent symptom, as evidenced by the sensations of the patient; by the rapidity of the breathing, which, however, is abrupt and shallow; by the working of the nostrils; and by difficulty of speech. The pulse-respiration ratio is greatly disturbed, the respirations ranging from 30 to 60, or occasionally even reaching 80 per minute. There may be orthopnœa. Cough also commences very soon. It does not come on in violent paroxysms, but is short and hacking, being often of a spasmodic character and difficult to repress, especially when the patient is made to breathe deeply or to sit up, while the act causes much distress. Expectoration speedily ensues, the sputa presenting peculiar characters. They are scarcely at all frothy, but exceedingly viscid and adhesive, so that they are discharged with much difficulty, often having to be wiped from the mouth, and not falling out when the vessel which receives them is overturned. They present a "rusty" colour, or various tints of red, owing to admixture of blood, but as the disease progresses changes of colour are observed, passing through different shades of yellow, until finally the expectoration becomes merely bronchitic in character. The microscope reveals epithelium; blood-discs; so-called granular or exudation-cells; sometimes minute ramifying coagula, which may be evident to the naked eye as small structureless masses in the sputa; and later on pigment-cells or free pigment, abundant granules and oil-globules; free nuclei; or occasionally pus-cells. Chemical examination yields mucin; albumen; often a little sugar; salts, especially chlorides; and, it is said, occasionally a special acid. The expired air may be cool, and is deficient in carbonic anhydride.

Such being the ordinary local symptoms of acute pneumonia, it must be borne in mind that considerable deviations may be noticed, dependent upon the age and condition of the patient; the portion and extent of lung-tissue affected; the type and course of the pneumonia: or upon the disease being secondary. Pain and other local symptoms are sometimes very slight or absent—*latent pneumonia;* while the sputa may be absent or merely bronchitic, or in low cases sometimes present the appearance of a dark, offensive, thin fluid, resembling liquorice or prune-juice. Occasionally they are tinged with bile.

General. These may be summed up as high pyrexia, with great depression and prostration.

The skin soon becomes exceedingly hot and dry, having a burning, acrid feel. Sometimes perspiration takes place, but the patient experiences no relief. The temperature rises with great rapidity to 102°, 103°, 105°, or even higher. The maximum is generally reached on the second or third day, but the temperature may continue to ascend until near the termination of the case. It has been known to rise to 107° in cases which have recovered; and in fatal cases it has attained 109·4°. In a large number of instances the temperature does not go beyond 103° or 104°. The daily variations are usually as follows:—The temperature is lowest in early morning, and begins to rise in the forenoon or soon after, attaining its maximum early in the evening; it then falls, but in some cases a slight rise is again observed at midnight, after which a gradual fall takes place. The remission ranges from ⅖° to 2·5°, but is seldom more than 1·8°. Usually it ceases altogether a day or two before the crisis occurs. In rare instances, when pneumonia is associated with intermittent fever, the temperature becomes quite normal in the mornings—*intermittent pneumonia.* An extension of inflammation or a relapse will disturb its normal course. There is usually considerable flushing of the cheeks, which may be more marked on the pneumonic side; sometimes a tendency to duskiness or lividity is noticed; or the face may present a yellowish, earthy tint. The expression is either painful and anxious, or heavy and stupid. Herpes is frequently observed on the face about the second or third day.

The pulse is usually frequent, being as a rule proportionate to the extent of the pneumonia. It ranges generally from 90 to 120, but may be much above this. At first strong, full, and incompressible, it subsequently becomes weak, small, and yielding, or sometimes intermittent or irregular. The sphygmograph affords useful indications as to the characters of the pulse.

A prominent symptom of pneumonia in most instances is the great and evident prostration and feebleness of the patient. The position assumed is generally dorsal, with the head rather high, and it is often only with difficulty that the patient can be made to sit up.

The digestive organs present to a marked degree the ordinary symptoms associated with pyrexia. The tongue tends to be dry; and the lips frequently become cracked. As occasional and usually unfavourable symptoms there may be dysphagia; severe vomiting; jaundice with enlarged liver; or diarrhœa. The ordinary cerebral symptoms are headache, sleeplessness, and restlessness, often combined with slight nocturnal delirium. The urine, in addition to being highly febrile, frequently contains a little albumen, and chlorides are strikingly deficient or entirely absent.

In some cases the symptoms assume an adynamic character, indicated by a dry brown tongue, with sordes; and low nervous phenomena, such as delirium, stupor, coma, convulsions, twitchings and tremors, and disorder of the special senses—*typhoid pneumonia.* This course of events is particularly apt to occur if the patient is old, very weak, or intemperate; if the disease is secondary to certain acute and chronic affections, or is attended with high pyrexia; or if it terminates in suppuration or gangrene, which causes extreme prostration. In drunkards the symptoms at first often resemble those of delirium tremens, followed by collapse. Occasionally they simulate symptoms of mania or cerebral inflammation. The formation of pus is usually attended with severe rigors, and increase of pyrexia. If it collects in an abscess, it may be suddenly discharged along with fragments of lung-tissue.

Sometimes distinct signs of cyanosis supervene, with distension of the right side of the heart and of the venous system, and the formation of coagula in the pulmonary vessels.

Physical Signs.—I. *Stoke's stage.* At this time the only sign is a harshness and roughness of the breath-sounds, these being usually exaggerated. I have had several opportunities of verifying that this stage is a reality.

II. *Engorgement stage.* 1. *Respiratory movements* are deficient, partly on account of pain. 2. *Vocal fremitus* is often increased. 3. *Percussion-sound* is usually not much altered, but may be abnormally clear, or slightly deficient in resonance. 4. *Respiratory souuds* are harsh and weak, or occasionally somewhat bronchial. 5. The principal physical sign is the *true crepitant rhonchus*, which is heard over the affected portion of lung.

III. *Red hepatization stage.* 1. There may be slight *enlargement of the side.* 2. *Movements* are greatly impaired, especially expansion. 3. *Vocal fremitus* is in excess. 4. *Percussion* as a rule reveals dulness with increased resistance; sometimes the percussion-note is rather hollow, and of tubular or even amphoric quality. In basic pneumonia a tubular or tympanitic note can sometimes be elicited over the front of the upper part of the chest. 5. The *respiratory sounds* afford one of the most important signs. Frequently they are typically tubular, dry, high-pitched, whiffing or metallic; sometimes merely blowing or bronchial. 6. *Crepitant rhonchus* is often heard at the confines of the inflamed part. 7. *Vocal* or *cry-resonance* is intensified, high-pitched, sniffling, and metallic. It may be almost œgophonic or pectoriloquous; and occasionally whispering pectoriloquy is observed. 8. There is no displacement of organs. The *heart-sounds* are frequently intensified over the affected part.

IV. *Resolution stage.* The chief additional physical signs at this stage are *redux crepitant rhonchus;* or thin *bubbling râles*, either large or small, of ringing or metallic character. The other abnormal signs usually disappear, sometimes with great rapidity, in other cases only slowly and gradually; sometimes they remain permanently. The dulness may subside in patches. Occasionally slight retraction of the chest follows an attack of pneumonia.

The signs just described are commonly observed at one or both bases. Variations may be met with, due to the consolidation becoming extreme, the tubes being completely blocked up; to the inflamed part lying deep in the lung; or to other unusual conditions. *Diffuse suppuration* gives rise to abundant, liquid, bubbling râles. *Abscess* or *gangrene* is followed by the signs of a cavity. The signs of bronchitis and pleurisy are often present. In the unaffected parts of the lungs respiration is exaggerated.

TERMINATIONS AND DURATION.—1. In the majority of cases pneumonia ends in complete recovery by *resolution*. Usually a marked *crisis* takes place, the temperature falling rapidly to or even below the normal, while the pulse and respirations also diminish in frequency, and the other symptoms speedily abate, convalescence being soon established. This happens usually from the third to the eleventh day, being most frequent about the end of the first week, but not necessarily on odd days, as some suppose. The crisis is attended either with profuse perspiration; with an abundant discharge of urine, which deposits lithates, oxalates, and phosphates, or sometimes contains blood; or occasionally with diarrhœa, epistaxis and other hæmorrhages, or the development of a skin-eruption. It may be followed by considerable and even fatal collapse. In some cases defervescence takes place by *lysis*, convalesence being protracted. Recovery may gradually ensue even after gangrene or abscess. A *relapse* sometimes happens. 2. Death may occur, either from asphyxia; or more commonly from collapse and exhaustion. This event may take place even after the crisis. 3. Now and then pneumonia becomes chronic, the exudation remaining unabsorbed, and the symptoms continuing, with irregular fever and loss of flesh. Ultimately a form of phthisis is sometimes set up.

DIAGNOSIS.—This subject will be again considered under the general diagnosis of acute lung-affections. At present it is only needful to call attention to the fact that pneumonia often comes on insidiously, and whenever this is probable, the chest should be examined at frequent intervals. This disease may also simulate low fevers; cerebral inflammations; or acute alcoholism.

PROGNOSIS.—Different observers have given very conflicting statements as to the rate of mortality in pneumonia, but it must always be looked upon as a serious affection. The chief circumstances which increase the danger are:—very early or advanced age; the female sex; pregnancy; debility from any cause; previous intemperance; the presence of chronic pulmonary, cardiac, or renal disease; extensive adhesions of the pleura or pericardium; the disease being secondary; both lungs being involved, or the whole of one, or its central or upper part; the sputa being very abundant and watery, or like prune-juice, or absent along with signs of accumulation in the lungs; the termination in diffuse suppuration, abscess, or gangrene; the development of typhoid and low nervous symptoms, or of those indicating marked collapse; signs of apnœa; the existence of serious complications, such as gastro-enteric catarrh or pericarditis; and a low epidemic type.

TREATMENT.—Of course it is highly important in treating pneumonia to observe all the precautions demanded in the management of lung-diseases in general, but at the same time the sick-room must be well-ventilated. Three main plans of treatment have been adopted in the management of this disease, termed respectively:—1. *Expectant.* 2. *Antiphlogistic.* 3. *Stimulant.* No constant and uniform method ought, however, to be followed, but it is essential that each case should be carefully considered in all its details, and the treatment modified accordingly.

1. The *expectant* plan, in which the patient is merely protected against injurious influences, and properly fed, while symptoms are relieved, the cure of the disease being left to nature, is one which unquestionably may be carried out with advantage in many instances; but to apply it to all cases indiscriminately is most injudicious.

2. In the *antiphlogistic* treatment, the chief remedies employed are venesection or local removal of blood; *tartar emetic; calomel* and *opium; digitalis, aconite*, or *veratria.* It has been satisfactorily proved that venesection is rarely required in the treatment of pneumonia, cases in which this measure might be indicated doing just as well without it, and in a great many instances it would be most injurious. The removal of blood may relieve dyspnœa and diminish fever, but only temporarily. Moderate bleeding is occasionally requisite, in order to avert death from apnœa. Local bleeding cannot subdue the inflammation, but it is useful sometimes in mitigating symptoms. *Tartar emetic* is decidedly a serviceable drug when the patient is strong and plethoric. It should not be given in large doses, from gr. ¼ to ¾ every four hours being quite sufficient for an adult, and it may be combined with *compound tincture of camphor* and *hydrocyanic acid.* Of the use in this disease of the other drugs mentioned I have no experience.

3. Many practitioners have recourse to the *stimulant* treatment, giving large quantities of alcohol, in the form of wine or brandy, along with *ammonia, chloric ether, camphor*, and similar remedies. The routine employment of these agents, however, is to be equally deprecated with those of the opposite class, for they are often unnecessary, and may do more harm than good. In many instances they are most valuable, the quantity to be given depending upon the nature of the case, and their usefulness or the reverse being judged of by the effects produced. It is a good rule to try them carefully in doubtful cases. The main indications for stimulants are the occurrence of delirium, if not associated with vascular excitement; a very rapid, weak, or dicrotic pulse; any signs of adynamia or collapse, with low nervous symptoms; the patient being old or feeble; and the pneumonia being secondary. In all low forms of the disease the only chance of recovery lies in free stimulation, a pint or more of brandy being often required in the twenty-four hours, and if this quantity is needed there ought to be no hesitation about giving it. At the same time full doses of *carbonate of ammonia* with *decoction of*

bark, *spirits of chloroform*, *ether*, *camphor*, *musk*, and such remedies must be administered. In some cases *quinine* with *iron* is useful; and in very adynamic conditions *oil of turpentine* has been recommended, which may be introduced by enema. In most instances it is advisable to give a little wine or brandy after the crisis, as there is often much exhaustion at this time.

Attention to *diet* is of considerable moment. In all cases a good quantity of beef-tea and milk should be administered at regular intervals, and abundant support is often needed. Cooling drinks are useful; or some saline drink may be freely allowed.

Local treatment. The application of cold to the chest has been advocated, either by means of wet compresses frequently changed, or of ice-bags covered with muslin. Great caution must be exercised in their employment. Hot fomentations or poultices, either alone or with anodynes; turpentine fomentations; or sinapisms are useful for the relief of pain. Blisters are only needed in the advanced stage of pneumonia as a rule, and not even then if absorption is going on satisfactorily.

Opiates are frequently required to relieve pain, to procure sleep, and to alleviate distressing cough. They must be given with due caution. Hypodermic injection of *morphia* is often most valuable. *Hydrate of chloral* is a useful substitute in many cases, as well as other sedatives and narcotics. If there is high pyrexia, full doses of *quinine* should be tried, but it might be requisite to have recourse to baths. Should expectoration be very difficult, on account of excessive viscidity of the sputa, *alkalis* are recommended. *Chloride of ammonium*, *tincture of squills*, and *decoction of senega* are useful in such cases, especially during the later stages.

Every care is necessary during convalescence, and the patient should be kept under observation until thoroughly restored to health. Tonics are serviceable at this time, with good diet; and *cod-liver oil* proves beneficial in some cases.

II. CATARRHAL PNEUMONIA. DISSEMINATED OR LOBULAR PNEUMONIA. BRONCHO-PNEUMONIA.

ÆTIOLOGY.—This variety of lung-inflammation may assume an *acute* or *chronic* form, and in the great majority of cases it arises in the course of bronchitis, being either the result of direct extension of inflammation along the minute bronchi to the air-vesicles; or more commonly being set up in collapsed lobules. *Acute catarrhal pneumonia* is by far most prevalent amongst children, being particularly observed in connection with hooping-cough, measles, diphtheria, and influenza, but it may arise independently of these affections. It is predisposed to by debility; by breathing impure air; and by a long-continued recumbent posture. There is reason to believe that the pneumonia occurring in the aged and feeble, and in those dying from acute or chronic diseases, is not infrequently of this nature. As a more or less *chronic* affection, resulting from gradual extension of bronchial catarrh into the alveoli, catarrhal pneumonia is now looked upon by many pathologists as originating a large proportion of cases of phthisis. It may be set up in connection with dilated bronchi.

PATHOLOGY AND ANATOMICAL CHARACTERS.—There is no fibrinous exudation in catarrhal pneumonia, such as is characteristic of the croupous variety, but merely a proliferation of the cells lining the alveoli, which become so abundant as to fill and distend the latter. In favourable cases the cells undergo liquefaction, and are absorbed or discharged. Sometimes abscesses are formed; or cheesy degeneration ensues, ultimately leading to destruction of the lung-tissue, or to tuberculosis. Chronic interstitial pneumonia may also be set up. When catarrhal pneumonia follows lobular collapse, the morbid appearances are usually confined to isolated lobules, but by their coalescence large tracts of lung-tissue may be involved, especially at the bases and along the posterior borders. Generally they are mingled with signs indicative of bronchitis; with congestion and œdema; or merely with collapsed lobules. The inflamed lobules are disseminated irregularly through both lungs, being most abundant towards the bases, along the lower free border, and at the surface. They vary in size considerably, and when superficial have a pyramidal or wedge-like form, with the base directed outwards, projecting somewhat beyond the surface. They feel like firm solid knots, but are in reality friable, breaking down readily under pressure. A section presents a more or less greyish-yellow colour, gradually fading into surrounding congestion, and it has also generally a granular aspect. A whitish, opaque, non-frothy fluid can be scraped or pressed from the surface, containing abundant cells, many of which resemble under the microscope pus and mucus corpuscles. Within the lobules there are often small dilated bronchi, containing a purulent fluid. The affected parts sink instantly in water. The appearances just described are those met with when the inflammatory process is well-established, but gradual transitions are observed from merely collapsed lobules.

When the inflammation is independent of collapse, very numerous, small, ill-defined, whitish-yellow spots are seen scattered through congested and œdematous lung-tissue, only slightly granular, and yielding an opaque milky fluid on pressure. In some parts little cavities form, containing a pus-like matter, but many observers are of opinion that this has gravitated into the minute bronchi or air-vesicles, or has been drawn in during inspiration.

SYMPTOMS.—Usually occurring in the course of some other complaint, especially bronchitis, the symptoms of acute catarrhal pneumonia may set in very speedily, as in measles; or gradually, as in hooping-cough. Generally they are merely modifications of previously-existing symptoms. Very rarely is the onset indicated by any rigors or other marked premonitory phenomena, such as are observed in ordinary pneumonia. Pyrexia is a most important sign, the temperatnre rising often to 103°, 104°, or 105°; the remissions, however, are considerable, and irregular as to time, while renewed exacerbations are liable to occur after the temperature has become normal. The skin often perspires freely, and is not pungent or burning to the feel. The pulse increases in frequency, but soon tends to become feeble or irregular. The *local* symptoms, when the complaint follows bronchitis, are increased dyspnœa, the respirations being exceedingly frequent; a change in the characters of the cough, which often becomes short, harsh, hacking, and painful, the child endeavouring to repress the act, and presenting an expression of pain, or crying on account of the suffering; and diminished expectoration, the sputa being scarcely ever "rusty." *Physical signs* are exceedingly uncertain and ill-defined. In the parts corresponding to the consolidated portions of lung there may be increased vocal fremitus; deficient resonance: bronchial breathing; small, scattered, crepitant or crackling; and sometimes ringing râles; and bronchophony.

The *course* of the disease may be exceedingly acute and rapid; or subacute. In the former class of cases there is generally great restlessness and anxiety; or the patient may soon fall into a stupid and apathetic state. Signs of cyanosis are common. Loss of strength and emaciation are prominent characters, the latter being especially marked in the less rapid cases. The subsidence of the disease in cases of recovery is usually very gradual and protracted, there being no crisis, but an irregular defervescence by lysis. As already mentioned, catarrhal pneumonia may lead to permanent destructive changes in the lungs.

TREATMENT.—All lowering measures are decidedly injurious. *Ipecacuanha wine* is useful, with salines; or *ammonia* and *senega* may be given, if there is much debility. Abundant nourishment is required, with alcoholic stimulants in many cases. Emetics are sometimes serviceable, to aid in unloading the lungs. The continued application of cold compresses to the chest has been strongly recommended. Sinapisms are often of much benefit. Great care is required during convalescence, and tonics, *cod-liver oil*, good diet, with wine, are indicated at this time.

III. CHRONIC OR INTERSTITIAL PNEUMONIA. CIRRHOSIS OF LUNG. FIBROID PHTHISIS. FIBROID DEGENERATION. INDURATION WITH DILATED BRONCHI.

ÆTIOLOGY AND PATHOLOGY.—The forms of pneumonia already described may become more or less chronic, but the condition now under consideration is one in which the lung becomes greatly contracted and indurated, as well as much pigmented, the air-vesicles being more or less obliterated, and the bronchial tubes usually dilated. These changes are generally regarded as being partly due to proliferation of the normal interlobular and sub-pleural connective-tissue, and partly to the formation of a nuclear growth, which develops into extensive tracts of fibroid tissue; but some pathologists look upon them as the result of a chronic inflammatory process, or of a fibroid change affecting the walls of the alveoli themselves. There can be no doubt but that in the great majority of cases this disease is *secondary* to some previous pulmonary affection, being set up in consequence of long-continued irritation. The conditions of which it may thus be a sequel are:—1. Acute croupous pneumonia very rarely. 2. Catarrhal pneumonia frequently. 3. Dilatation of the bronchi, though Dr. Wilson Fox thinks that the fibroid change is then preceded by catarrhal pneumonia. 4. Collapse or compression of the lung. 5. Pleurisy, but it is doubtful whether the change can then extend to any depth, unless pneumonia precedes it. 6. Bronchial irritation from inhalation of mineral and other particles, such as steel, coal or stone dust, or cotton. 7. Various forms of local pulmonary mischief, such as the formation of tubercle or cancer; phthisical cavities; pulmonary hæmorrhage or abscess; or injury to the lung. In these conditions the morbid process is localized, and may really be a method of cure.

Some pathologists, however, consider that interstitial pneumonia is in some instances essentially *primary*, being, as some suppose, the result of a chronic inflammatory process in the interstitial tissue, resembling that which takes place in cirrhosis of the liver; or, as others believe, a direct, idiopathic, fibroid change, degeneration, or substitution in the walls of the alveoli, quite independent of inflammation, which process tends to spread through the lung. No cases bearing out this view have ever come under my own notice.

It is necessary to allude to the relation of dilated bronchi to chronic pneumonia. Doubtless in many cases this dilatation is secondary to the induration; but there is every reason to believe that the former is sometimes the original morbid condition, and gives rise to the fibroid change.

ANATOMICAL CHARACTERS.—In the early stage of chronic pneumonia the pulmonary tissue is congested, but it afterwards becomes paler, and may exhibit extensive tracts of a homogeneous-looking, nucleated substance. When the process is advanced, the appearances are very characteristic. The lung is contracted and shrunken; while its tissue is hard and dense, cannot be torn, and creaks on being cut. A section is smooth, dry, and pigmented, often presenting a marbled grey aspect; while fibrous bands or masses may be seen traversing the surface, some of the former being probably obliterated and thickened bronchi or blood-vessels. The vesicular tissue is destroyed, but many of the bronchi are usually dilated. The fibrous growths may ultimately become caseous.

The extent of lung-structure involved varies considerably. The change may be limited at first to the bronchi and the tissue immediately surrounding them; or it may only be visible around morbid deposits or cavities. A peculiar feature of interest is, that the condition is usually limited to one lung, which it may affect throughout, or be confined to its base, apex, or middle part.

The pleura is generally thickened, sometimes extremely so, and its surfaces are adherent. Emphysema is common in unaffected parts of the lungs; and other morbid conditions are frequently seen, of which the chronic pneumonia is a sequel.

SYMPTOMS.—Interstitial pneumonia runs a very chronic course, and its symptoms at first are indefinite, but when it is fully established, well-marked clinical characters may be present. The *local* symptoms include dragging pains about the sides; shortness of breath; and cough, which is often irritable, but at the same time difficult and ineffectual, or it comes on in fits, attended with the expectoration characteristic of dilated bronchi. The complaint is often attended with *general* symptoms, viz., very gradual loss of flesh and strength, anæmia, and sometimes night-sweats; but pyrexia is absent as a rule, or it is but slight. After a time signs of obstructed circulation in the right side of the heart and venous system may set in.

PHYSICAL SIGNS.—These indicate dense consolidation and contraction of the lung-tissue; which may be combined with signs of cavities due to enlarged bronchi. 1. The chest is more or less *retracted* on the affected side, often to an extreme degree. 2. *Movement* is deficient or absent. 3. *Vocal fremitus* may be increased or diminished. 4. *Percussion* gives a hard, wooden, high-pitched sound, with marked resistance. Occasionally the sound is tubular in some parts. 5. *Respiration sounds* differ in different parts, being weak or absent, bronchial, tubular, or occasionally cavernous. After a cough the breath-sounds are frequently heard where previously absent. 6. Various *râles* may be audible in the dilated bronchi. 7. *Vocal resonance* is variable, being deficient, bronchophonic, or occasionally pectoriloquous. 8. The heart is often displaced towards the affected side; the opposite lung is enlarged and encroaches in this direction; and the liver may be drawn up.

TREATMENT.—The management of chronic interstitial pneumonia is really that of a certain form of phthisis. Nourishing diet is necessary, with tonics, *iron*, and *cod-liver oil*. Counter-irritation is often useful, especially by means of *tincture of iodine*. *Iodide of potassium* has been recommended internally, for the purpose of promoting absorption, but it is of very questionable value for this end. Cough must be alleviated, and expectoration improved, by means of the usual remedies. The patient must be warned against unnecessary exertion if the disease is extensive, as this is sure to bring on shortness of breath.

CHAPTER X.

GANGRENE OF THE LUNG.

ÆTIOLOGY.—The conditions under which gangrene of the pulmonary tissue may arise are the following:—1. As the result of *local disease*, viz., acute or chronic pneumonia, phthisis, cancer, hydatids, or bronchial dilatation. 2. From *obstruction* of one or more of the nutrient vessels by an embolus. 3. In connection with *blood-poisoning*, as after low fevers, pyæmia or septicæmia, glanders, or poisoning by venomous animals. 4. In consequence of *extreme exhaustion*, arising from want of food and bad hygienic conditions, or from disease. 5. In certain *nervous diseases*, pulmonary gangrene being observed occasionally in cases of chronic dementia, chronic softening of the brain, alcoholism, and epilepsy.

ANATOMICAL CHARACTERS.—Pulmonary gangrene is either *circumscribed* or *diffuse*. In the *circumscribed* variety, which is that usually seen, the part involved is distinctly defined, but its extent varies much. The usual size varies from that of a hazel-nut to a walnut, but a considerable portion of a lobe may become gangrenous. The lower lobes, and the superficial parts of the lungs, are most liable to be affected. The gangrenous portion soon becomes moist, softened, pulpy, bluish-green, and extremely fœtid; or it may have a greenish-black core, with broken-down lung-tissue around, a stinking, irritating liquid escaping on pressure. The materials may be discharged through a bronchus, leaving a ragged sloughy cavity, often with inflamed tissue around. Vessels frequently traverse this space, but as the blood contained in them has coagulated, hæmorrhage does not take place as a rule. Rarely it communicates with the pleural cavity, or even opens into the subcutaneous cellular tissue, in consequence of adhesions having formed between the contiguous surfaces of the pleura. Subsequently in very exceptional cases a fibrous capsule is developed, the sphacelated portion is expelled, and a cavity secreting healthy pus remains, which may ultimately close up and cicatrize.

The *diffuse* form does not present any line of demarcation, but runs into, or is mixed up with congested, inflamed, or œdematous lung-tissue. A whole lobe or even the greater part of a lung may be implicated, being more or less softened, sometimes in a state of pulpiness; of a greenish or brownish-black or black colour; more or less saturated with a dirty greyish-black liquid; and, in short, in the condition of a moist, stinking, putrid slough.

SYMPTOMS.—The only symptoms which are characteristic of gangrene of the lung are an extremely fœtid and peculiar smell of the breath: and the expectoration of gangrenous matters, mingled with fragments of lung-tissue. The former may precede the latter symptom for some days, and it is sometimes only observed at intervals. It must be remembered, however, that the breath may be very foul in some cases of chronic bronchitis, and in connection with dilated bronchi or certain cavities. The sputa subsequently become foul and frothy; partly liquid, partly muco-purulent; often dirty, and brownish or blackish in colour; while they contain gangrenous particles and occasionally fat crystals, and elastic fibres may be detected in some cases. More or less blood is often present, and death may result from hæmorrhage. On standing the sputa separate into layers, and a thick sediment falls. The *general* symptoms in most cases are those of extreme depression, adynamia, and collapse, accompanied with low nervous phenomena, ending in speedy death. If the gangrenous materials are swallowed, severe diarrhœa, with tympanitis, is liable to set in. Emboli may be carried from the lung, and originate septicæmic abscesses elsewhere. Occasionally death takes place slowly, preceded by the signs of hectic fever; or very rarely recovery may ensue.

PHYSICAL SIGNS.—At first these are merely indistinct breathing. with moist *râles;* followed, if the gangrene is circumscribed, by more or less marked signs of a cavity, containing thin fluid. Extensive bronchitis or pleurisy is often set up.

PROGNOSIS is necessarily exceedingly grave in cases of pulmonary gangrene, the termination being generally fatal.

TREATMENT.—The measures to be adopted are to administer abundant nourishment, as well as large quantities of alcoholic stimulants, with *ammonia* and *bark*, *ether*, *camphor*, *mineral acids*, or *quinine;* to use frequent inhalations of *creosote*, *carbolic acid*, *tar-vapour*, or *turpentine;* to encourage expectoration in every possible way; and to let the patient gargle freely with some antiseptic, especially *Condy's fluid*, and to drink a solution of *chlorate of potash* or *yeast*. Various antiseptics have been recommended internally, such as *carbolic acid* or *sulphocarbolates*, *sulphites*, or *hypochlorites*. Should the disease become chronic, as well as during convalescence of those cases in which recovery ensues, tonics are needed, with *cod-liver oil*, change of air, nutritious diet, and other measures for improving the general health.

CHAPTER XI.

EMPHYSEMA OF THE LUNGS.

Two primary forms of this affection are met with, named respectively VESICULAR and INTERLOBULAR. *Vesicular* emphysema is characterized by enlargement of air-vesicles, resulting either from their excessive distension, from destruction of their septa, or from both causes combined. *Interlobular* emphysema signifies the presence of air in the sub-pleural and interlobular cellular tissue, which is usually the consequence of rupture of vesicles.

I. VESICULAR EMPHYSEMA.

ÆTIOLOGY AND PATHOLOGY.—Within the definition of this morbid condition as above given, cases are comprised which differ considerably in their clinical aspects and importance. They may, however, be arranged in four groups, though these are frequently more or less conjoined, viz:—1. *Acute emphysema*, either general or local. 2. *Chronic hypertrophous*, or "*large-lunged.*" 3. *Chronic limited.* 4. *Atrophous*, or "*small-lunged.*" It will be convenient to consider first their ætiology as a whole; and then to indicate the special causation of each individual form.

Immediate, direct, or *determining causes.*—1. *Inspiratory theory.* According to this view emphysema is the result of excessive or long-continued distension of the air-vesicles during inspiration. Thus it is supposed that general emphysema may arise as a consequence of diminished expiratory force, such as that which accompanies the loss of elasticity in the lungs and chest-walls in old age, the inspiratory force remaining unimpaired. Hence the lungs are kept constantly distended, the more so in proportion to the vigour with which inspiration is performed. Again, when portions of the lungs are from any cause, such as pleuritic adhesions, collapse, or consolidation, rendered partially or entirely incapable of expansion, should the chest still enlarge to the usual extent during inspiration, the air which ought to enter these unused portions passes into other parts, and stretches their vesicles unduly. This is named *vicarious* emphysema. Dr. C. J. B. Williams believes that in this way emphysema is originated in bronchitis, the secretions formed, or the thickened mucous membrane obstructing some of the bronchi, and preventing the air from entering the corresponding vesicles, whilst those which are adjacent and have free tubes communicating with them, receive an excessive amount of air. On the other hand, Laennec held the view that the vesicles terminating the obstructed bronchi become themselves dilated, in consequence of air entering during inspiration which cannot be forced out during expiration; hence the emphysema was termed *substantive*. It has been argued against this theory that expiration is a more powerful act than inspiration; to which it is replied that a forced expiratory effort has very little influence in emptying the air-vesicles, especially if the smaller tubes are obstructed.

2. *Expiratory theory*. Sir William Jenner strongly advocates the theory that emphysema is commonly the result of violent expiratory efforts with partial closure of the glottis, such as are carried on during the act of coughing, lifting heavy weights, playing wind instruments, and other actions. There are certain parts of the lungs which are much less supported and compressed by the chest-walls and surrounding structures than others, and hence they yield under the pressure of air from within, and become distended. This applies especially to the apices, the anterior margins, and the edges of the bases, particularly the left. The tendency to the development of emphysema in this way is greater in proportion to the degree to which the lung is inflated; to the obstruction to the escape of air through the air-tubes; to the force which is exercised in its attempted expulsion; and to the want of compression and support of the lung-tissue.

Niemeyer laid much stress on the direction of the expiratory force in originating emphysema. He observes, "In all these acts (*i.e.*, coughing, straining, &c.) contraction of the chest is effected by vigorous upheaval of the diaphragm. The result is the expulsion of a strong current of air from the lower bronchi, the direction of which is obliquely upward, and, if the air be prevented from escaping through the larynx, a portion of it, in a compressed state, must be driven into the upper bronchi, whose direction is obliquely downward. By the centrifugal pressure exerted, by the air thus compressed, upon the vesicles of the upper lobes of the lung, and upon the adjacent thoracic wall, the latter become distended as far as it is possible for them to yield."

3. Some pathologists are of opinion that emphysema is due to *primary nutritive derangement* of the walls of the air-vesicles. Villemin describes a "hypertrophy of the elements of the vesicular mem-

brane, causing an extension of this, and an increase in the capacity of the vesicles." As a secondary result of emphysema, nutritive changes in the walls of the vesicles are constantly seen; and should these be impaired in their resisting power, they are far more liable to become distended by any force acting upon them from within. Hence in old persons one attack of bronchitis will often set up a considerable amount of emphysema; and when chronic bronchitis or pulmonary congestion has existed for a length of time, the resulting alterations in structure render the vesicles much more liable to become distended. Atrophous emphysema is the consequence of a *primary degeneration*, the partitions wasting and disappearing, several vesicles being thus thrown into one; but in other forms of the complaint, degenerative changes must probably be rather looked upon as *predisposing* or "*permanence-securing*" causes of emphysema, as Sir William Jenner terms them, than as actual determining causes. These morbid changes will be further considered under the ANATOMICAL CHARACTERS.

4. Another theory, that of Freund, is, that in some cases there is a *primary chronic enlargement of the chest*, in consequence of hypertrophy and rigidity of the cartilages, and that the lungs become distended and emphysematous in order to fill up the increased space. This must be a very exceptional cause.

No exclusive theory as to the mode of production of emphysema can apply to all cases; and in many undoubtedly more than one of the causes just considered has contributed to the development of the morbid changes.

Exciting causes. 1. Emphysema is liable to arise in connection with several pulmonary affections, viz., bronchitis, especially chronic dry catarrh; consolidation or destruction of portions of the lung from any cause; collapse; or extensive pleuritic adhesions or effusion. 2. Hooping-cough is a common cause in children. 3. Croup and other affections which obstruct the main windpipe, and excite much cough at the same time, are often followed by emphysema. 4. Cardiac diseases which lead to permanent congestion of the pulmonary capillaries materially aid in its production, by inducing degenerative changes in the walls of the air-vesicles. 5. Emphysema may be directly induced by playing wind instruments, excessive effort, lifting heavy weights, straining at stool, climbing hills, and other forms of exertion.

Predisposing causes. Hereditary influence has been regarded as predisposing to emphysema, especially in those cases in which it comes on during early life, but this is by no means certain. The complaint is by far most common in persons advanced in years. Children, however, often suffer, in consequence of their liability to pulmonary affections, and the weakness of their chest-walls. Gouty and fat subjects are said to be predisposed to emphysema.

Special ætiology. The causation of the several forms of emphysema demands brief consideration. What is termed *acute general emphysema*, which is common in connection with extensive bronchitis, is due to an inability to expel the air out of the lungs, in consequence of obstruction of the bronchi, and it therefore accumulates in the small air-tubes and air-vesicles, and inflates the lungs. Many authorities object to this condition being called emphysema, and name it *insufflation* or *inspiratory expansion*, because there is no actual disease, but merely an inflation of the lungs, which will subside if the obstruction is speedily removed, but if this does not happen permanent emphysema is liable to be established.

The main difficulty lies in determining the mode of production of *chronic hypertrophous emphysema* following chronic bronchial catarrh. It is regarded by many as being *inspiratory* in its origin, but Sir William Jenner considers it to be the result of forcible *expiration*, and explains its general distribution by the fact that as the lungs and chest enlarge, the relative position of the former to the ribs and intercostal spaces becomes constantly changed, so that successive portions of the lung are brought into correspondence with the spaces, and these being less supported than the parts opposite the ribs, they are unduly distended during cough, and thus ultimately the lungs become more or less emphysematous throughout, though the condition is at the same time most marked at the apices and margins, which are least supported of all.

Localized emphysema, whether acute or chronic, is probably as a rule developed during *expiration*. In some instances it is *inspiratory* in its origin, being either *substantive* or *vicarious*.

Ordinary *atrophous emphysema* is merely due to wasting of the septa, which become more or less obliterated, so that the vesicles coalesce to a variable degree; in short, it consists in an atrophy of the lung-tissue, usually observed in old age, along with other atrophic and degenerative changes.

Anatomical Characters.—In *acute general emphysema* the lungs are distended throughout; and do not collapse, or may even bulge out when the chest is opened. The degree of expansion varies much. The lungs appear pale, the capillaries being stretched, and their network enlarged. The bronchi will be found to be more or less obstructed,

Chronic hypertrophous emphysema is also attended with enlargement of the lungs, and on opening the thorax these organs are seen to extend beyond their ordinary limits, often covering the pericardium completely, and they may protrude or collapse only very imperfectly, this necessarily depending upon the extent of the disease. Though the morbid condition is more or less general, the apices, the anterior borders, and other parts of the lungs which are least supported present the most marked evidences of the change, and the surface is usually more affected than the deeper parts. The emphysematous portions have a peculiar soft feel, compared to that of a "cushion of down," and they retain the impression of the finger, elasticity being impaired. The so-called crepitant sensation of healthy lung is deficient or absent, and on cutting a dull creaking sound is often heard. The affected tissue is pale, bloodless, and dry, but presents irregular spots of black pigment, derived from altered blood contained in obliterated capillaries. The vesicles are seen to be enlarged more or less, varying usually from a hemp-seed to a pea in size, but often many of them are thrown into one, thus giving rise to irregular spaces of considerable size, which are traversed by slender bands, the septa being either visible as slight ridges, or having disappeared entirely. Contiguous lobules may freely communicate, and ultimately nothing may be left but a coarse network. These appearances are best observed after inflating the lung, drying it, and then making a section.

The nature of the changes which the alveolar walls undergo has been much discussed, but there is no reason whatever to suppose that these should be identical in all cases. The violence of the pressure of the air which originates the emphysematous condition may rupture the septa and walls directly, but usually their destruction is gradual. They become stretched and atrophied; present perforations varying in size and number; and ultimately only traces of them are seen, or they may disappear altogether. The structural alterations which have been described are the formation of an imperfect fibrous tissue, inducing toughness and thickening, as the result of long-continued congestion (Jenner); or fatty degeneration (Rainey). Dr. Waters of Liverpool considers that there is a primary mal-nutrition of the pulmonary tissue, leading to its degeneration, but the exact nature of this he has been unable to ascertain. The elastic and other elementary tissues disappear. The capillaries in the affected part become stretched, narrowed, or obliterated; or some of them may even rupture. Ultimately they are absorbed, and only pigment is left, the remains of the colouring matter of the blood.

In the *localized* variety of emphysema, the appearances are confined to certain parts, especially the apices and the anterior and lower edges, being similar to those described as characteristic of the more extensive form.

In true *atrophous* emphysema the lungs are diminished in size; shrink into a very small bulk when the chest is opened; and are very light. The divisions between the lobes are unusually vertical. The pulmonary tissue is pale but much pigmented, dry, and deficient in elasticity. The air-vesicles are enlarged, owing to atrophy of their septa.

Other morbid conditions are often seen in emphysematous lungs, such as bronchitis, collapse in some parts, or, not uncommonly, dilated bronchi. Pleuritic adhesions generally exist. When the emphysema is extensive, the contiguous structures are displaced, and after a time all the organs of the body become the seat of congestion and the changes resulting therefrom. Different statements have been made as to the position of the heart. My own observation would lead me to agree with those who describe it as lying with the right border horizontally on the diaphragm, and the apex too much down and to the left. Its right cavities become dilated and hypertrophied in course of time.

SYMPTOMS.—It is only the *chronic hypertrophous* form of emphysema which leads to any prominent symptoms, and these are chiefly of an indirect character. This condition interferes with the due aëration of the blood, while the pulmonary circulation is obstructed from several causes, but especially on account of the destruction of the capillaries; consequently the right side of the heart is affected in time becoming the seat of dilatation and hypertrophy, with tricuspid regurgitation; the general venous system also becomes overloaded, and the various organs and tissues are permanently congested, leading to dropsy and important organic changes. The lungs, moreover, are generally the seat of bronchial catarrh or other morbid conditions; and fits of spasmodic asthma, or acute attacks of bronchitis are liable to occur.

Dyspnœa, variable in degree, is the main symptom directly due to emphysema. At first there is merely "shortness of breath" on exertion, especially on going upstairs or up a hill, as well as after a full meal, but ultimately persistent *expiratory* dyspnœa is experienced, though not accompanied with much distress ordinarily, but rather with a sense of discomfort and uneasiness. It is often relieved by pressing the sides, or by lying on the abdomen. After a meal the breathing is worse, especially should the patient be suffering from dyspepsia, and dyspnœa becomes necessarily much aggravated if bronchitis or asthma should set in. The causes of the dyspnœa are the interference with the respiratory movements, owing to the depressed state of the diaphragm, and the rigid state of the chest-walls; the difficulty in expelling the residual air, and the small amount of pure air inhaled; and the actual loss of surface fit for aërating the blood. Cough is frequently present, but is chiefly the result of bronchial catarrh, when it is attended with expectoration, otherwise it is dry. There is no pain in the chest directly dependent upon emphysema.

The remaining symptoms which may be observed in cases of emphysema are indirect. Those due to interference with the circulation will be more appropriately described in connection with heart-diseases. (See Vol. II., pages 2—3). As the result of the increased respiratory efforts the respiratory muscles often hypertrophy; hence the neck appears to be large. The fat is absorbed, giving rise to emaciation, with strongly-marked features. The symptoms due to imperfect blood-aëration are similar to those already described, only that they are gradually produced; and there is general apathy and languor, with a flabby and relaxed state of the muscles from this cause.

Physical Signs.—These will necessarily differ much according to the extent and variety of the emphysema; and the morbid conditions with which it is associated. 1. *Shape and size of the chest.* In *general hypertrophous* emphysema the chest is more or less enlarged bilaterally, either throughout, or only in its upper or lower part. It may assume a permanent inspiratory form, or even go beyond this, becoming "barrel-shaped" and almost circular. There is often a rounding of the chest in front and of the back behind, but sometimes the change in shape is chiefly observed on one of these aspects. The ribs become more horizontal, and the intercostal spaces wider in proportion to the enlargement, and the cartilages are frequently quite rigid: In *localized* emphysema there may be corresponding bulging. *Atrophous* emphysema is associated with a small chest, the ribs being very oblique, the lower ones almost vertical. 2.

Respiratory movements. Expansion is more or less deficient or absent, and there may be merely a general elevation of the chest. Expiration is prolonged. 3. *Percussion* reveals increased area of pulmonary sound, except in atrophous emphysema; and also in most cases increased amount of resonance, with fall in pitch, the sound tending towards a tympanitic character, but being frequently more or less muffled. If the distension of the lungs is extreme, there is deficient resonance, with undue resistance. 4. *Respiratory sounds.* The most important change usually noticed is the great prolongation of the expiratory sound, but this is not observed in the atrophous variety. In pure emphysema the breath-sounds are weak, but of harsh quality. The extent over which they are heard is increased. 5. A *crepitant rhonchus* is said to be sometimes heard. *Râles* due to bronchial catarrh are often present, especially sonorous and sibilant rhonchi. 6. *Vocal fremitus* and *resonance* are quite unreliable. As a rule they are deficient. They may be observed over a larger area than usual. 7. There are signs of *displacement of organs*, especially of the heart. Epigastric impulse is common. 8. The veins in the neck often afford signs of obstruction to the circulation, but not in the atrophous form.

PROGNOSIS.—Emphysema is serious in proportion to its extent. It lays the foundation for a very miserable existence in many cases; increases the tendency to bronchial catarrh; and adds greatly to the danger from an acute attack of bronchitis. Once it is thoroughly established, emphysema cannot be cured.

TREATMENT.—This part of the subject may be very briefly summed up, not because it is unimportant, but because the principles on which it must be conducted need only be mentioned here, the means for carrying these out being described in other parts of this work. 1. Every precaution must be taken against the occurrence of bronchial catarrh, not only on account of its danger, but because each attack tends to increase the emphysema. Other known causes of emphysema must be avoided. 2. It is very important to look to the alimentary canal, as a deranged condition of its functions frequently considerably increases the discomfort attending emphysema. 3. The conditions which may be associated with emphysema must be attended to as they arise, especially asthma; cardiac diseases; venous congestion and its results, including dropsy; and the pulmonary complications which occur in its course, particularly bronchitis. Narcotics must be used with particular caution when the lungs are extensively emphysematous. 4. It is often requisite to improve the general health and the condition of the blood, by the aid of tonics, *iron*, and *cod-liver-oil;* or to treat some constitutional diathesis, espeally gout. 5. Whether there is any curative remedy for emphysema is very questionable. Degenerative changes may be checked by proper dieting. The administration of *strychnine*, the use of galvanism, breathing compressed air, and other measures have been stated to produce some improvement.

A change of climate is often exceedingly beneficial in cases of emphysema. Usually a mild climate, not too dry, suits best; but it is frequently a matter of personal experience as to which is most suitable. It has been recommended to spend the summer in pinewood regions, where there is a heavy fall of dew.

II. Interlobular or Interstitial Emphysema.

Ætiology.—This is a very rare condition, resulting usually from rupture of the air-vesicles, as a consequence of excessive pressure upon their interior during forcible expiration, the glottis being at the same time much contracted. Thus it may be induced by violent cough, laughing, or straining during defæcation or parturition. Interlobular emphysema is said to be not uncommon in croup; and to occur sometimes as the result of extensive pulmonary collapse. Gangrene of the lung or post-mortem decomposition may lead to the presence of air in the interlobular tissue.

Anatomical Characters.—Accumulations of air are seen under the pleura, varying in size, but generally small, and they may form a border of minute vesicles around the lobules. The air can by pressure be displaced along the course of the boundaries of the alveoli. Superficial collections occasionally give way, opening into the pleura and thus giving rise to pneumothorax; or into the posterior mediastinum, leading to general subcutaneous emphysema.

Symptoms.—The only symptom which might lead to the suspicion of interstitial emphysema is the occurrence of severe dyspnœa following one of its causes. It is said that a faint *friction-sound* is sometimes heard. Should pneumothorax or general subcutaneous emphysema be produced, these conditions would be indicated by their usual signs.

Treatment.—This consists in taking every precaution to prevent the mischief from extending; and in attending to its consequences.

Chapter XII.

ASTHMA.

The use of this term is ambiguous, but it may be employed to include all cases characterized by the occurrence of severe paroxysmal attacks of dyspnœa. Four chief forms may be enumerated, viz:—1. *Laryngeal.* 2. *Bronchial,* either *spasmodic* or *paralytic,* depending upon spasm or paralysis of the muscular fibres of the bronchial tubes. 3. *Hæmic,* due to an abnormal state of the blood or of the circulation. 4. *Diaphragmatic,* associated with spasm of the diaphragm and other respiratory muscles. Only *bronchial* and *diaphragmatic* asthma need be discussed in the present chapter.

I. Bronchial Asthma—Spasmodic Asthma.

Ætiology.—It is not improbable that in some instances asthmatic attacks depend upon a *paralytic* condition of the bronchial tubes.

This may be the effect produced by certain poisonous gases; and by paralysis of the vagus nerve. Ordinarily, however, the paroxysms seem to be *spasmodic* in their origin, being due to spasm of the muscular fibres excited through the nerves, the irritation being either *centric, direct*, or *reflex*. The causes of spasmodic asthma may be arranged as follows:—1. The complaint may be *idiopathic* or *primary*, there being no obvious source of irritation, and the attacks are then sometimes distinctly periodic. 2. *Direct inhalation* of certain materials is a frequent cause, such as fog or smoke; irritating gases and vapours; dust; odoriferous emanations from animals, or from vegetable matters, especially hay, ipecacuanha, and certain flowers. The conditions of the atmosphere breathed often materially influence the occurrence of asthmatic attacks, these being especially liable to be brought on by excessively damp or dry air, or by cold easterly winds. Different asthmatic patients present remarkable peculiarities as to the qualities of the air which suits them best, but as a rule a rather moist and relaxing atmosphere is least injurious, and that of high and country districts is worse than that of low districts or of large towns and cities. 3. Asthma is very commonly associated with *bronchitis, bronchial irritation*, or *emphysema*. 4. *Cardiac diseases* may induce true spasmodic asthma, by giving rise to pulmonary congestion. 5. Asthma may be *gastric* in its origin, following more or less speedily the introduction of food into the stomach. In some cases any kind of food will bring on a fit; in others only indigestible or special articles, such as stimulants or sweets. Usually this form of asthma is looked upon as being due to reflex irritation, but Dr. Hyde Salter was of opinion that it generally depends upon an "offending condition of the blood," brought about by the introduction into the circulation of deleterious matters during digestion. 6. Various *reflex* sources of irritation may induce asthma, *e.g.*, uterine derangements; hardened fæces in the rectum; the sudden application of cold to the skin; cold feet; or boils. 7. Occasionally an asthmatic attack is *centric* in its origin, as when it accompanies violent emotion or hysteria; or in those very rare instances where it results from organic disease about the roots of the vagus nerves. 8. Irritation of the *pneumogastric nerves* in their course may in exceptional cases be the cause of asthma.

Dr. Berkhart advocates the following view with regard to the nature of asthma. He considers it to be a symptom attending all diseases of the lungs in which the pulmonary tissue is deficient in elasticity. It most frequently accompanies emphysema, when this is fully developed, and during its latent stage of development. In consequence of the deficiency of the elasticity, the force of expiration is greatly reduced, and obstacles to the interchange of gases are overcome only by prolonged and unusual efforts. Such obstacles are:—1. Hyperæmia of the mucous membrane causing occlusion of the bronchial tubes, from atmospheric influences, and the inhalation of foreign bodies. 2. Inflammation of the mucous membrane, followed by the production of thick fibrinous sputa. 3. Compression of the bronchial tubes. 4. Interstitial œdema. 5. Embolism of the pulmonary artery.

Predisposing causes.—In a large number of cases asthma commences within the first ten years of life, but the complaint increases in frequency from 20 to 50 (Salter). Men suffer much more than women. Hereditary predisposition appears to have some influence.

SYMPTOMS.—In some cases *premonitory* indications of the approach of a fit of asthma are observed, especially in connection with the nervous system. Occasionally there is an abundant discharge of pale watery urine. There may be gradually-increasing dyspnœa and other chest symptoms for a variable period before the actual attack. In many cases, however, this is quite sudden in its onset, coming on without any warning. It sets in in the great majority of cases early in the morning, especially from two to three o'clock; but the taking of meals, the recumbent position, effort, sleep, and other causes may determine the time of the occurrence of a paroxysm. In many instances a distinctly periodic tendency is noticed, and the interval may be remarkably uniform, the attack being either associated with some evident cause or being independent of any such cause.

Characters of a paroxysm.—The patient experiences an extreme sense of suffocation and want of breath, with tightness and oppression across the chest; loosens every article of clothing; and seizes upon every means for obtaining fresh air. The position assumed varies in different cases, the patient either sitting, standing, or kneeling, and fixing the hands or elbows on some support; or the attitude may be frequently changed. Violent respiratory efforts are made, every muscle being called into action, while the shoulders are raised, and the head is thrown back, the mouth being kept widely open. In consequence of these exertions the sweat often pours off the upper part of the body. The rate of breathing is frequently not increased, but inspiration is very short, abrupt, and jerky, while expiration is greatly prolonged, often terminating with a sudden effort at expulsion of the air, and being immediately followed by the inspiratory act. Respiration is noisy and wheezing. Soon signs of overloading of the venous system and of deficient aëration of the blood appear, and they may become very marked, the extremities being cold, and the pulse small and quick, or sometimes irregular. The duration of the struggle varies greatly in different cases, and it may go on for a long time with remissions or intermissions. The length of the asthmatic fits is often remarkably uniform in any particular case. The attack ends either suddenly or gradually, this depending much upon its duration; and upon whether it is allowed to run its course, or is checked by some powerful agent. Generally a cough sets in towards the close, followed by a small amount of expectoration, in the form of little pearl-like grey pellets of mucus. In some cases the expectoration is considerable and continues for some time, especially if the paroxysm is prolonged, and then the asthma is termed *humid.* Occasionally hæmoptysis occurs, usually very slight, but sometimes abundant.

Physical signs.—During a paroxysm of asthma the physical signs are very characteristic, as evidencing constriction of the bronchial tubes, and interference with the passage of air. 1. The chest is frequently *enlarged*, the lungs being inflated. 2. *Expansile movements* are greatly deficient or absent; while the intercostal spaces, supra-sternal and supra-clavicular fossæ, and the epigastrium sink in markedly during inspiration. The rhythm of the movements is altered, as above described. 3. *Percussion-sound* is extra-resonant; and inspiration or expiration produces little or no effect upon it. 4. *Auscultation* discloses feeble or absent breath-sounds where the tubes are constricted, with loud puerile sounds where they are free; along with *dry rhonchi* in every conceivable variety. At the close some *moist râles* may often be heard. Important characters presented by these auscultatory signs are, that they are frequently limited in their extent; and are constantly liable to change their place rapidly. Upon the sudden cessation of the bronchial spasm, an exaggerated breath-sound may be heard where a moment before no sound was audible. Usually both lungs are affected, but occasionally only or chiefly one of them, and then breathing is excessive on the unaffected side.

State in the intervals.—This will depend upon whether the asthma is or is not due to organic disease. Immediately after an attack a feeling of exhaustion is usually experienced, with uncomfortable sensations about the chest; but when these pass off patients generally feel relieved, and enjoy an immunity from further paroxysms for a time. As a case of asthma progresses, the fits tend to become more frequent but less severe.

It will be convenient briefly to allude here to the affection named *hay-asthma* or *hay-fever*. This appears to be due to idiosyncracy, being only observed in particular subjects, who suffer every hay-season, often without any evident exposure to the exciting cause. The same effects may be produced by breathing the powder of ipecacuanha. The symptoms are those of coryza and bronchial irritation, attended with severe cough; short asthmatic attacks, especially at night; as well as much languor and a sense of depression and want of energy, but no pyrexia. They set in acutely, and last for a variable time.

DIAGNOSIS.—Bronchial asthma is sufficiently characterized by the paroxysmal and usually sudden nature of the attacks; their peculiar characters, severity, duration, and often sudden termination; the physical signs of temporary constriction of the bronchial tubes, with absence of fluid in them; the effects of treatment; and the complete or comparative absence of dyspnœa in the intervals. It has chiefly to be distinguished from emphysema, bronchitis, and cardiac dyspnœa, but it must be remembered that asthma may complicate these conditions. It may also be mistaken for laryngeal asthma.

PROGNOSIS.—The immediate prognosis in cases of asthma is favourable, death during a paroxysm being a rare event. The prognosis as to recovery is more hopeful if the patient is young; if the attacks only come on at long intervals, and are not severe or prolonged; if during the intervals the patient feels well, and there is no organic disease; and if the paroxysms are traceable to some obvious cause, which can be avoided. The history of the progress of the case will afford some aid in determining the prognosis.

TREATMENT.—1. *Prevention of an impending attack.*—In those cases where there are premonitory signs of a fit of asthma, it may be possible to avert this by drinking strong coffee; removing every source of irritation; heating the body, or in some cases applying cold to the back; or smoking *stramonium* or *belladonna.* Various other preventive measures are recommended.

2. *During a paroxysm.*—Any obvious exciting cause must be at once removed, for instance, an emetic or enema being employed should the attack be due to a loaded stomach or rectum; as much fresh, dry, warm air as possible must be obtained; and everything that can obstruct the breathing should be loosened. The position of the patient needs to be studied; the sitting or kneeling posture is usually the best, with the elbows supported so as to raise the shoulders, but not uncommonly patients must be allowed to choose the posture which they find most comfortable.

The remedies recommended for asthma are exceedingly numerous, chiefly belonging to the class of depressants; sedatives and antispasmodics; or stimulants. Different cases are relieved by totally different treatment, and in many instances it is at first quite an experiment as to what will suit best, but patients learn by experience what gives them most speedy relief. The chief remedies which may be of service when given internally are depressing emetics and nauseants, especially *ipecacuanha* or *tartar emetic*; *tincture of belladonna, conium, hyoscyamus, datura stramonium* or *tatula; opium* or *morphia; ether; tincture of lobelia* in gradually-increasing doses, frequently repeated; *cannabis indica;* strong hot *coffee,* without milk or sugar, taken on an empty stomach; some spirit with boiling water in equal parts; or fragments of ice rapidly swallowed. *Inhalations* are of great value, some of them being directly inspired; others being smoked, either in a pipe or in the form of a cigarette. The most important remedies for direct inhalation are *ether*, *chloroform*, or a mixture of these agents; *nitrite of amyl,* which has been strongly recommended by Dr. Talfourd Jones of Brecon, but must be very cautiously employed; and the white fumes which arise from ignited *nitre-paper.* The principal substances smoked are *tobacco, stramonium, belladonna,* or a mixture of these, and considerable relief is often thus obtained, but of course great care must be exercised in conducting this mode of treatment. Subcutaneous injection of *morphia* is beneficial in some cases.

Various other measures prove serviceable in some instances, such as applying cold or heat to the surface of the chest; ice to the spine; the use of warm friction or turpentine fomentations over the chest; sinapisms to various parts; putting the hands and arms into warm water; a warm foot-bath with mustard in it, cold water being drunk at the same time; or a weak galvanic current along the course of the vagus nerves.

3. *During the intervals.*—At this time the main points to be attended to are to study the locality which suits the patient best, as regards the qualities of the air and other conditions; to pay strict attention to

the state of the alimentary canal and to the diet, as well as to the functions of the organs generally; and to avoid everything which is known to bring on an attack of asthma. In many cases the habitual use of some of the remedies already mentioned may ward off the fits, such as smoking *tobacco* or *stramonium*, or inhaling the fumes of *nitre-paper* or *chloroform*. If any organic disease is present, this must be treated accordingly. A course of *quinine*, *strychnine*, or some metallic tonic is very serviceable in many cases. Galvanism or counter-irritation along the vagus nerves, the inhalation of compressed air and various other measures have been advocated for the cure of asthma.

With regard to *hay-asthma*, it is necessary to avoid the cause of this complaint, and the sea-side seems to offer the best protection, or if possible a voyage should be taken. During the attack small doses of *hydrocyanic acid* with *tincture of lobelia* or other antispasmodics may be given at frequent intervals. Weak inhalations of *creosote* or *chlorine* have been recommended; and also injection of *quinine* into the nostrils. As preventive measures the administration of *quinine* and *iron*, *arsenic*, *nux vomica* or *strychnine*, and other tonics might be tried, along with cold bathing. Dr. Reynolds found the systematic inhalation of a few drops of *chloroform* useful.

II. Diaphragmatic Asthma.

A form of asthma has been described, supposed to be due to spasm of the diaphragm and other muscles of respiration, and having the following characters. The respirations are diminished in number, and the difficulty in breathing is limited to expiration, which is greatly prolonged, inspiration being short and abrupt, while but little air enters the lungs. The abdominal muscles become rigid and hard, and may cause expulsion of the urine and fæces. There is a sense of much distress, and signs of imminent suffocation may appear. Should the spasm subside, this event is not followed by cough or expectoration. *Physical examination* reveals distension of the lungs, undiminished during expiration. There are no dry râles, such as are heard in spasmodic bronchial asthma. I have seen symptoms very similar to those just described brought on by an immoderate fit of laughter.

Chapter XIII.

ATELECTASIS. APNEUMATOSIS. PULMONARY COLLAPSE. PULMONARY COMPRESSION. CARNIFICATION.

These terms all signify a condition in which the lungs are to a greater or less extent merely devoid of air, so that the affected portions are useless for respiratory purposes. *Atelectasis* strictly refers only to lungs which are more or less in their fœtal condition, not having expanded properly. The other terms indicate a return to this condition, either from *collapse*, in consequence of air being prevented from entering the vesicles through the air-passages; or as the result of external *compression* of the lung.

Ætiology.—1. *Collapse.*—The results of experiment and observation show that the ultimate effect of complete and continued obstruction or narrowing of a bronchial tube from any cause, is collapse of the vesicles which it supplies. The explanation of this is as follows:—The bronchi become smaller as they divide, and the air drawn in during inspiration drives on any obstructing material, so that at last it reaches a point where it causes complete closure, and thus no air can enter the vesicles. During expiration the obstructing plug is forced out to some extent, and a certain quantity of air escapes, but it again returns with inspiration, acting in fact like a " ball-valve." Hence, as no new supply of air enters the vesicles, and that previously contained in them is gradually expelled, they finally collapse entirely. It is supposed also that some of the imprisoned air may be absorbed. In the great majority of cases the obstruction is associated with bronchitis, either simple or complicating measles, hooping-cough, or croup, especially if its products are very tenacious and viscid, but they need not be of this character. Infants are extremely prone to suffer from pulmonary collapse, and this condition is especially frequent during the first year of life, and in children who are ill-nourished or rickety. Among the chief *predisposing* causes are a yielding condition of the chest-walls, and a weak state of their muscles; inability to cough and expectorate; distension of, or pressure upon the abdomen, preventing the movements of the diaphragm; and the previous existence of atelectasis.

When pressure is exerted on a main bronchus, as by an aneurismal or other tumour, the whole lung may ultimately become collapsed.

2. The chief causes of direct *compression* of the lung are accumulations of fluid or air in the pleural cavity, or agglutination of its surfaces; great pericardial effusion or cardiac enlargement; intrathoracic tumours or aneurisms; deformities of the thorax; and abdominal enlargements invading upon the chest, as from ascites, an ovarian tumour, an enlarged liver or spleen, or a hydatid tumour.

Anatomical Characters.—The morbid appearances in *atelectasis* and *collapse* are very similar. Usually distinct lobules are involved, these being scattered through different parts of the lungs. The margin of the bases, the tongue-like prolongation of the left upper lobe, and the middle lobe of the right lung present collapsed lobules most frequently; and next in order come the back of the upper and lower lobes on both sides. Superficial lobules are much more commonly affected than those which lie deep in the lungs.

The precise characters will vary according to the duration of the collapse, and the amount and conditions of the blood in the affected lobules. At first there is congestion, but soon the blood coagulates in the vessels, and then undergoes changes, becoming decolorized, firm, and contracted, the vessels being finally obliterated. The walls of the alveoli after a time adhere together, and catarrhal pneumonia is frequently set up. As seen on the surface of the lung, the collapsed portions have a well-defined outline, and are usually sunk below the surrounding level, but not always. Their size depends upon that of the bronchus obstructed. The colour varies considerably, ranging from deep-purple to light-red, but being usually dark-red or of a somewhat violet hue. Whitish streaks are evident on close examination, indicating the division into smaller lobules. A section is quite smooth, but varies in colour, and it shows the collapsed part to be somewhat pyramidal in shape, with the base outwards. The tissue is quite airless and non-crepitant, usually of a tough and firm consistence, and when situated in a thin margin of lung the collapsed portion may be felt between the finger and thumb. Pieces sink in water. The affected lobules can usually be inflated to a greater or less degree by means of a blowpipe introduced into the communicating bronchus, and they then enlarge, assume a light-red colour, and come to resemble normal lung-tissue, but they soon subside unless the bronchus is tied. In proportion to the degree of congestion will be the depth of colour, bulk, firmness, and difficulty of inflating the collapsed portions. In course of time they become paler, looser but tough in texture, and cannot be expanded, as the walls of the vesicles adhere. The tubes proceeding to collapsed lobules will usually be found to contain some obstructing secretion. Other parts of the lungs are frequently the seat of emphysema..

Compression drives the air and blood out of the lungs to a variable degree, and the appearances differ accordingly. When the air is alone expelled, while the blood remains, the lung-tissue is dark-red, moist, but very firm and dense, and this is the condition known as *carnification*. Finally it becomes grey; anæmic, but pigmented; dry; of a tough leathery consistence; and incapable of insufflation.

SYMPTOMS.—Dyspnœa, with quick and shallow breathing; feeble and ineffectual cough; signs of deficient blood-aëration; and marked wasting and exhaustion are the phenomena attending pulmonary collapse, their severity being necessarily in proportion to the extent of the mischief, and the rapidity with which it is set up. Death is a very frequent termination in children, and may take place speedily or gradually. The *physical signs* are:—1. Those of *inspiratory dyspnœa*, the chest falling in more or less during inspiration. 2. *Dulness* over the affected parts. 3. Weak or bronchial *breath-sounds*. In many cases, however, no physical signs whatever can be observed; and they may be obscured by emphysema, bronchitis, and other morbid conditions.

Considerable compression may exist without any symptoms, if it is produced gradually. In this condition a few dry crepitant râles may sometimes be heard at the close of a deep inspiration—*compression-rhonchus;* and the heart is often unduly exposed.

PROGNOSIS.—Extensive collapse is exceedingly dangerous in children, especially if the patient is very young, feeble, and placed under bad hygienic conditions. This condition adds greatly to the fatality of bronchitis, hooping-cough, measles, and croup.

TREATMENT.—When pulmonary collapse is suspected during an attack of bronchitis in children, the main objects in treatment are to assist the respiratory efforts and the discharge of the obstructing secretion. Friction with oil over the chest, as recommended by Dr. Graily Hewitt; artificial respiration; the application of sinapisms; an emetic of *sulphate of zinc* or *ipecacuanha;* and the administration of expectorants, constitute the chief measures which are available. A warm bath is of service occasionally. The diet must be carefully attended to, and much support is often required, this being adapted to the age of the patient; stimulants are also frequently useful. If there are signs of apnœa, the warm bath with the cold douche should be tried. As regards the treatment of compression, the removal of its cause as speedily as possibly is the chief indication.

CHAPTER XIV.

PHTHISIS—PULMONARY CONSUMPTION.

UNQUESTIONABLY several distinct affections are included under the term *pulmonary phthisis*, all of which, however, tend to produce similar results, viz., consolidation followed by destruction of the lung-texture; and wasting of the blood and tissues of the body. In this work little more can be done than to give an outline of the main facts and theories relating to this extensive and difficult subject.

ÆTIOLOGY.—*Hereditary or family predisposition.*—There can be no doubt as to the existence of an inherited tendency to phthisis, but the proportion of cases in which this is apparent has been very differently stated by different observers. Further, many consider that a *specific diathesis* is thus transmitted, whereas others believe that it is merely a *constitutional debility*, and that this may be present in children born of parents in a low state of health from any cause, as well as in those derived from consumptive parents. Dr. C. T. Williams has arrived at the following conclusions on this subject:—1. Family predisposition occurs more commonly among, and exercises a more decided influence on, females than males; and the former have a greater power of transmission than the latter. 2. Fathers transmit more frequently to sons, and mothers to daughters, than the converse. 3. Family predisposition does not directly shorten the duration of the disease. 4. It precipitates the onset of the disease, and thus shortens the duration of life. *Age.* Most cases of phthisis are met with from 20 to 30 years of age. The disease is not often observed during early childhood or in advanced age, but may come on at any period of life. It is usually more rapid in its progress in young subjects. *Constitutional condition.* Persons who are feeble and delicate are most liable to be affected. *Occupation.* Phthisis is very common among those whose employment exposes them to various irritant inhalations; to causes originating a cold;

or to the influence of certain unfavourable hygienic conditions. *Habits.* Sedentary habits and want of exercise, intemperance, masturbation, excessive sexual indulgence, and debauchery generally, are the chief causes of phthisis coming under this head. *Diet and digestion.* The mal-nutrition resulting from an imperfect supply of nutriment to the system from any cause, has a powerful influence in developing phthisis, especially in the young. This may be associated with an insufficient amount or improper quality of food; or with a want of power of assimilation, on account of dyspepsia or of various diseases interfering with digestion. Some writers have laid great stress on a deficiency of fat in the system as a cause of phthisis, either from a want of supply, or because it cannot be digested. *Interference with respiratory functions.* Want of ventilation and fresh air, and the consequent breathing of an impure atmosphere, materially assists in the production of phthisis; hence the complaint is common among those whose occupation compels them to remain in a close confined room for many hours during the day, as well as in many instances during the night, such as sempstresses or tailors. It is also frequent in ill-ventilated institutions where many persons are gathered together, especially children, for example, orphan-asylums and prisons. Whether interference with the respiratory movements, due to pressure of stays or to posture, has any effect in the production of phthisis, is a matter of dispute. Dr. McCormac attaches great importance to "rebreathed air" as a cause of consumption. *Climate and locality.* Dampness of soil, and abundant moisture in the atmosphere, have been proved to be powerful predisposing causes of phthisis. It is most prevalent in those climates characterized by rapid changes of temperature, or by prolonged cold with dampness. The tubercular form is said to be favoured by a high temperature. Elevated regions are remarkably free from phthisis, while those which are situated low present a large number of cases. It has been stated that malarial districts are comparatively free from the disease. *Mental causes.* Severe mental depression, as from anxiety, grief, or over-study, certainly seems to have considerable influence in some cases in originating phthisis. It is not uncommon among the inmates of lunatic asylums. *Previous and existing diseases.* Phthisis may follow measles, hooping-cough, croup, typhus, typhoid, scarlatina, and other acute diseases. Repeated attacks of bronchitis greatly favour its development; and it may also result from pneumonia, especially the catarrhal form; from pleurisy; and probably from laryngitis. Under this head may be mentioned miscarriages; bad confinements; prolonged lactation; continued or excessive discharges, or the suppression of such discharges, all of which certainly increase the tendency to consumption. It is liable to set in during the course of diabetes; as well as in connection with diseases of the alimentary canal and other parts which interfere with the consumption or assimilation of food. Dr. Pollock has remarked that young women who are anæmic or chlorotic are peculiarly free from phthisis, but the complaint does sometimes attack such subjects, and may come on very insidiously. *Infection.* It has been imagined that consumption is capable of transmission by infection through the breath, but the evidence of such a mode of origin is extremely unsatisfactory.

Such are the principal causes which may lead to phthisis. It is not practicable to divide them into *predisposing* and *exciting*, as most of them may under different circumstances belong to either class. They may be separated into two groups as regards their mode of action, the one tending to induce a low and unhealthy state of the constitution; the other to excite local irritation in connection with the pulmonary organs. In the great majority of cases it will be found that several causes have been at work in originating the disease, and often there is a combination of both classes. With regard to the immediate origin of phthisis, it may or may not be traced to a definite *exciting cause*, such as a cold or some other source of pulmonary irritation.

PATHOLOGY.—Until within the last few years phthisis was almost universally looked upon as essentially a *tubercular* disease, depending upon the deposit and ultimate breaking-down of tubercle in the lungs, causing destruction of their tissues, with the formation of cavities. The importance of inflammatory processes in the production of this disease had been recognized by a few observers, such as Addison, Williams, and others, but it is only comparatively recently that they have been assigned the prominent position which they now occupy with many pathologists. There is a very wide difference of opinion, however, upon this subject at the present day. Undoubtedly phthisis has different modes of origin, and in the following remarks it is proposed to indicate the various ways in which the consumptive process might arise, in accordance with the principal views now entertained.

1. *Inflammatory forms of phthisis.*—(i.) A comparatively few cases of phthisis result directly from an attack of *acute croupous pneumonia*, especially if this should affect the apex of the lung, the inflammatory products undergoing a process of caseation instead of being absorbed, and ultimately breaking down, thus leading to disintegration of the pulmonary tissue. It has been suggested by Dr. C. J. B. Williams that a continued high temperature and other agencies may have the effect of hardening the cells in the exudation, in this way lowering their vitality, and preventing their development or removal. Acute pneumonia may also originate phthisis by terminating in the formation of abscesses or in gangrene.

(ii.) *Catarrhal pneumonia*, either *acute* or *chronic*, is the variety of pulmonary inflammation to which Niemeyer attributed the origin of the large majority of cases of phthisis, and he believed that this might arise under the following circumstances:—*a*. As the result of extension of a simple acute or chronic bronchitis into the air-vesicles. He was of opinion that this might occur in a person constitutionally strong, but that it is more liable to happen in the case of those who are debilitated and in a low state of vitality, and that the products are in such subjects more likely to undergo the destructive processes to be presently mentioned. Most cases of *acute* or *galloping* consumption were attributed by him to catarrhal pneumonia complicating extensive acute bronchitis. *b.* From inflammation set up in collapsed lobules associated with bronchial catarrh, *e.g.*, after measles or hooping-cough. *c.* By extension of inflammation due to the inhalation of irritant particles into the air-vesicles, in connection with certain occupations. *d.* As the consequence of the irritation of blood poured out into the bronchial tubes, which, instead of being expectorated, has remained and become coagulated, subsequently setting up catarrhal inflammation.

The explanation of the destructive changes, as described by Niemeyer, is as follows:—Cells, the products of inflammation, accumulate in the aveoli and minute bronchi, crowd upon each other, becoming densely packed, and thus by their mutual pressure they bring about their own decay, as well as that of the lung-textures by interfering with their nutrition, the alveolar walls being also themselves damaged by the inflammatory process. The morbid materials therefore become caseous, and may undergo calcification or absorption, or be ultimately discharged, giving rise to cavities.

Different observers have described special forms of pneumonia as leading to phthisis, which they designate by such terms as albuminous, scrofulous, tubercular, or caseous, but Niemeyer denied that the inflammation has ever any specific characters, and affirmed that all varieties may end in caseous degeneration and consequent phthisis. My own experience is decidedly in favour of Niemeyer's views on this point.

(iii.) It is highly probable that some cases of phthisis originate in inflammatory changes chiefly implicating the *walls of the alveoli* and the minute *bronchioles*, with their surrounding tissue.

(iv.) *Chronic interstitial pneumonia* leads to destruction of the lung, and, as already mentioned, this morbid condition is termed *fibroid phthisis*. It is observed to a greater or less extent in most phthisical lungs.

2. *Phthisis from new growths.* (i). The usual new growth which originates phthisis is *tubercle.* Niemeyer held that *primary tubercular phthisis* is rare, and that when tubercle is found in the lungs, which is by no means always the case in consumption, it is as a rule secondary to caseous degeneration of inflammatory products, being formed chiefly in the neighbourhood of these materials; or, should it be primary, some cheesy masses or other sources of infection will be found in other parts of the body. He considered that acute deposit of tubercle in the lungs is more likely to occur as a primary event than chronic; that primary tuberculosis is observed with greater relative frequency in those who are predisposed to inflammation ending in caseous degeneration; that the greatest danger for most consumptives lies in their liability to become tuberculous; and that though tubercle may give rise to pneumonia, this is far less extensive than when the inflammation is the original mischief.

On the other hand many eminent authorities will not accept these views, but maintain that the formation of tubercle is the first step in the consumptive process in most cases, and that this morbid product undergoes degenerative changes, while at the same time it produces irritation and excites inflammation; in short, that as a rule phthisis is essentially a constitutional, tubercular disease.

It cannot be doubted but that many of the morbid conditions described as *tuberculous infiltration* are not associated with tubercle at all, but are inflammatory in their origin.

(ii.) Under the class of new growths may also be mentioned those rare cases of destruction of lung-tissue which apparently result from the breaking-down of *syphilitic gummata.* Some writers would also include *hydatid* disease as a form of phthisis.

3. *Vascular obstruction.* Occlusion of branches of the pulmonary artery probably contributes to the destructive process in some cases of phthisis. A recent writer, Dr. Reeves, has described a special variety of the disease observed in Australia, originating in embolism of the pulmonary branches, and consequent localized gangrene of the lung.

Having thus considered the *ætiology* and *pathology* of phthisis generally, it will be expedient in the subsequent treatment of the subject to give a separate account of the disease as it occurs in its *acute* and *chronic* forms.

I. Acute Phthisis—Galloping Consumption.

Anatomical Characters.—Now and then the *post-mortem* examination merely reveals the remains of an *acute croupous pneumonia,* which has ended in destruction of the lung-tissue. In more cases there are evidences of extensive *bronchitis* with *catarrhal pneumonia,* which may invade large tracts of lung-tissue, the products being soft and caseous, and easily breaking down, or irregular cavities of various sizes having formed here and there. The lower lobes are usually most involved. Signs of more or less extensive pleurisy are also observed. In other instances the pulmonary affection is but a part of *acute tuberculosis,* the lungs, in common with other organs, being studded throughout with grey miliary tubercles, at the same time being much congested, especially in dependent parts, but not inflamed. In this form of acute phthisis caseous masses will frequently be found, either in the lungs or elsewhere.

Symptoms.—The clinical history of acute phthisis is that of a febrile disease, which is attended with prominent pulmonary symptoms, and as a rule with signs of consolidation and subsequent destruction of portions of the lungs. It may attack a person previously healthy to all appearance, but this is not usually the case. Hæmoptysis is sometimes the first symptom noticed. The *course* is in some instances extremely rapid and virulent, but any case of phthisis ending within a few months would be considered acute.

When acute phthisis originates in *croupous pneumonia,* it is indicated by a continuance of the chest symptoms and fever, with abundant sweats and wasting; while the *physical signs* show persistence of the consolidation, followed by softening and the formation of cavities. When associated with *bronchitis* and *catarrhal pneumonia,* the local symptoms include pains about the chest; considerable dyspnœa; frequent cough; and abundant expectoration, which may be "rusty."

There is considerable pyrexia, especially at night; accompanied with much sweating, repeated rigors in many cases, rapid wasting; and great debility. *Physical signs* at first reveal merely the presence of bronchitis. Afterwards there will be indications of consolidation, softening, or excavation in various parts, these being often most marked towards the bases, viz., dulness; bronchial or hollow breath-sounds; crackling, followed by large, moist, and often ringing râles; and increased vocal fremitus and resonance. Pleuritic friction-sound is also heard in many cases.

In the *acute tuberculous* form the symptoms are those of very high fever, with intense prostration and adynamia, as described under acute tuberculosis; there being also extremely hurried breathing and cough, but no marked physical signs, only râles significant of pulmonary catarrh and subsequently of œdema being observed. There may be evidences of tubercle in other parts.

Diagnosis.—This subject will be considered in a future chapter; at present it is only necessary to mention that care must be taken to avoid confounding acute phthisis with certain specific fevers.

Treatment.—According to the nature of the case, the treatment of acute phthisis will either be that of ordinary pneumonia; of extensive catarrh, with catarrhal pneumonia; or of acute tuberculosis. Lowering measures are not well borne; but a supporting and stimulating plan of treatment is indicated. If there is high fever, full doses of *quinine* may be given, or the application of cold cautiously tried. Various symptoms, such as pain, cough, dyspnœa, hæmoptysis, and sickness, often need attention. Local applications to the chest, in the form of poultices, sinapisms, turpentine fomentations, or blisters, are frequently serviceable.

II. Chronic Phthisis.

Anatomical Characters.—The appearances observed in the lungs in connection with chronic phthisis vary greatly in different cases, according to the nature of the destructive process; the changes which have taken place during its progress; and the other morbid conditions with which it is associated. As a rule, but not always, the disease begins and is most extensive and advanced at the apex, the entire upper lobe becoming afterwards involved from above down, and subsequently the lower, so that the morbid changes are seen in various stages, often retrograding in one part while extending at another, and they may be of a different nature in different portions of the lungs. In persons who die of phthisis both lungs are usually implicated to a greater or less extent, though not equally. The disease, however, usually commences in, and may be limited to one lung, or even to a small portion of it; and may undergo curative changes, so that when the patient dies from some other cause, evidences of former pulmonary mischief are observed.

The primary morbid condition in the development of phthisis is *consolidation* of some kind. This may originally present the characters of the ordinary grey hepatization of pneumonia, but only in very exceptional cases; of, most commonly, a gelatinous-looking infiltration, greyish, homogeneous, and smooth on section, at first limited to lobules, but afterwards involving the pulmonary tissue extensively, and supposed to be due to catarrhal pneumonia or infiltrated tubercle, according to the view entertained with regard to its pathology; or of grey miliary tubercles, either separate, or, more frequently, collected in groups. The formation of true tubercle is probably in the large majority of cases a secondary process, but may be primary, and it is produced either in the perivascular sheaths; in the walls of the air-vesicles; in the mucous membrane of the bronchi; or in the neighbouring adenoid tissue.

The tendency in all these morbid products is to undergo caseation and subsequent disintegration to a variable degree and extent, either rapidly or gradually. As a result considerable alterations in their aspect and characters are observed. The affected parts become yellow, opaque, and soft, and give rise to the appearances formerly regarded as characteristic of yellow tubercle. When tubercles become caseous, small yellow nodules are seen, but these are frequently simulated by a section of a bronchial division or of alveoli enclosing caseous matter. There is no doubt but that complete liquefaction may take place finally, followed by absorption or expectoration of the morbid products, and ultimate recovery. Frequently calcification ensues, hard calcareous nodules or masses remaining in the lungs. The further course of phthisis, however, is characterized ordinarily by the continued softening of the morbid materials, which are finally discharged through the bronchi and expectorated, *cavities*, *excavations*, or *vomicæ* being thus originated in the lungs. These vary greatly in number, form, size, and other characters. Often they are of wide extent, in consequence of continued enlargement and coalescence; or several may communicate together in an anfractuose manner. They increase by an inflammatory infiltration of the walls, with subsequent caseation and disintegration; or by the formation and destruction of secondary tubercle. Their walls are irregular at first, and they contain generally a purulent-looking substance; or sometimes a dirty, thin, and fœtid liquid. A variable number of bronchi are seen opening abruptly into a cavity, either directly or slantingly, and presenting circular or oval orifices. Obliterated branches of the pulmonary artery may be observed on the walls or passing across the space, but sometimes the vessels are not closed, and they may be the seat of small aneurismal dilatations or "ectasias," thus greatly increasing the liability to fatal hæmorrhage. Obliterated bronchi and thickened fibrous bands may also traverse a cavity. Niemeyer was of opinion that most of the excavations seen in phthisical lungs are due to dilated bronchi, but it is impossible to agree with this statement.

In most cases of phthisis more or less *chronic interstitial pneumonia* is set up, which often materially aids in arresting and repairing the mischief resulting from the disease. It arises in the neighbourhood of consolidations and caseous substances, sometimes forming dense capsules around them, or originating indurated masses; and also around cavities. The latter after a time tend to become smooth and apparently lined by a secreting membrane, should the consumptive process cease; subsequently they may gradually contract and finally close up, leaving only an indurated puckered cicatrix. In some very chronic cases of phthisis the lungs may present nothing but fibroid induration, with cavities in various stages of contraction. It must be remembered that this last condition originates in a different manner from that associated with ordinary *fibroid phthisis*.

In addition to the diverse appearances in the lungs resulting from the combination of conditions already described, these are generally further modified by their association with bronchitis, often with ulceration of the mucous membrane; dilated bronchi; emphysematous patches; pulmonary collapse; extravasations of blood; or recent pneumonia. Pleuritic adhesions and thickenings are always evident, especially at the apices, where a dense fibrous cap is often formed, which may be half an inch or more in thickness. In these adhesions new vessels are developed by extension from the intercostals, and thus a communication is formed between the latter and the vessels of the lungs.

Other structures besides the lungs are generally involved in phthisis, as will be pointed out when considering its complications.

SYMPTOMS.—Chronic phthisis presents considerable variations in its clinical history, both as regards its mode of onset and its subsequent course, but the symptoms bear a general resemblance in the different cases. The disease may commence quite suddenly, as by an attack of hæmoptysis; or it may remain after some acute affection; or may come on acutely, afterwards becoming chronic; or may set in gradually and insidiously. In the latter case the pulmonary symptoms are first observed in some instances, especially those indicative of chronic bronchial catarrh; in others signs of constitutional disturbance, or of derangement of the digestive organs are noticed at the outset. The symptoms may be described as *local* and *general*.

Local.—Pains in the chest and sides are common, though not usually severe. They seem generally to be either pleuritic or muscular, the latter being often the result of cough. Dyspnœa is frequently present more or less from various causes, but may be entirely absent. Respirations are usually increased in number, rising somewhat towards evening. Shortness of breath on exertion is very commonly complained of. Of course when the lungs are extensively diseased breathing is much affected. Cough is an essential symptom, and may for some time be the only one complained of. In its severity and characters it differs widely, and that by no means according to the extent of the disease. At first it is often dry and hacking. An abnormal condition of the throat or larynx not infrequently gives rise to cough, which in the latter case is generally of hoarse quality. It is usually worse on first lying down at night; after sleep; and after meals. A paroxysm is often terminated by vomiting, especially after food has been taken. Expectoration soon occurs in most cases, but much of the sputa come in many cases from bronchial tubes, which are the seat of catarrh. Their characters and amount alter during the course of a case, and they present much variety in these respects. At first they consist merely of clear mucus, or sometimes small opaque pellets are discharged; subsequently they become muco-purulent; and when cavities form, irregular, opaque, airless masses are generally expectorated, more or less greenish-yellow, which sink in water, and which when discharged on to a flat surface spread out in the form of a coin, hence named "nummulated." This kind of sputum is not characteristic of phthisical cavities, however, as it may be observed in mere bronchitis. The masses are mingled with more or less bronchial mucus. In some cases mere pus is expectorated, and occasionally a quantity of matter is suddenly discharged, owing to the opening of a cavity. The sputa often have an unpleasant odour, and they may be extremely offensive, but this is not common. In favourable cases, even after large cavities have formed, expectoration diminishes and may ultimately cease altogether. Examination of the sputa may reveal evident caseous or calcareous particles. Microscopic examination discloses epithelium; abundant newly-formed granular and pus-cells; blood-corpuscles; numerous fat-granules and oil-globules; calcareous granules; vegetable growths not uncommonly; and, in some instances, fragments of the lung-tissues, especially elastic fibres, the presence of these last elements being of great importance. Sugar may be detected chemically.

Hæmoptysis requires special notice. This symptom is observed to a greater or less degree in the large majority of cases of phthisis, varying, however, considerably as regards the amount and exact characters of the blood discharged, and the frequency of its occurrence. The amount of blood may range from mere streaks in the sputa to a quantity sufficient to prove immediately fatal, but death directly due to hæmoptysis is not a common event in phthisis. When blood is intimately mixed with muco-purulent matter, it has been stated to be pathognomonic of chronic pneumonia. The hæmoptysis is frequently, but not necessarily, brought on by some exciting cause, such as a violent cough. In certain cases it tends to be repeated, and may be almost periodic. When not abundant, the loss of blood seems to afford relief sometimes, but usually the effect of hæmoptysis, if in any quantity or if repeated, is to induce debility and anæmia, or it may increase the local mischief in the lungs.

It is believed by some authorities that the blood generally comes from the bronchial capillaries, but probably the pulmonary vessels are its usual source. These may be in a state of fatty degeneration; or, as already remarked, considerable branches may remain unobliterated or may be the seat of ectasias, and by their rupture give rise to fatal hæmorrhage.

General.—Pyrexia is a very important symptom in cases of phthisis, and one which should always be looked for by the systematic use of the thermometer. This instrument is particularly important in detecting an early stage of the disease, and in indicating its degree of activity. It has been also stated that the thermometer aids in determining the nature of the destructive process, tubercular phthisis being characterized by a more continuous fever than the other forms. This is a very questionable statement, however. As a rule marked daily variations in temperature are observed, and it increases considerably in the evenings. Towards the close of many cases of phthisis hectic fever in its most typical form is observed. Night-sweats are complained of in the large majority of cases. These tend to come on especially towards early morning, but not infrequently they set in as soon as the patient falls asleep, and may be so excessive as to saturate the bed-clothes, causing much distress and exhaustion. Loss of flesh is another prominent symptom, being dependent chiefly upon the pyrexia. This must be determined by frequent weighing, and no reliance ought to be placed on the mere statement of the patient. The emaciation is often extreme, and it is a matter of common observation that it is more marked about the body and limbs, and especially the chest, than in the face. The fat disappears, and the muscles feel flabby and wanting in tone. The chest-muscles are often very irritable on percussion. More or less anæmia is frequently observed, and there may be œdema of the legs from this cause. At first the blood is generally hyperinotic, but soon it deteriorates in quality. In many advanced cases the skin is dry and scaly. Among other external appearances which may be noticed are chloasma over the chest; greyness of the hair in this region; lankiness and falling-off of the hair generally; or bulbousness of the finger ends, with incurved or cracked nails.

The patient almost always complains of debility, varying in degree to the most absolute helplessness and exhaustion. The pulse is increased in frequency in many cases, and tends to be quick, sharp, small, and wanting in tone.

The digestive organs are generally out of order. Loss of appetite, thirst, and dyspeptic symptoms are often complained of. Not uncommonly the mouth, tongue, and throat are red and irritable, this being accompanied with signs of subacute gastritis. The tongue is generally more or less furred. In some instances the stomach is extremely irritable, retching and vomiting being immediately excited when anything is taken. The breath has in not a few cases a very peculiar odour, which has appeared to me to be quite characteristic. At the close thrush is not infrequently observed. It has been stated that phthisical patients have a peculiar dislike to, and difficulty in the digestion of fatty substances, but there are many exceptions to this statement. Constipation is the rule at first, but later on there is a great tendency to diarrhœa. A red line along the gums, and transverse cracking of the teeth, have been described as significant of phthisis, but they are frequently absent, and are not at all characteristic.

Consumptive patients are inclined to be irritable and fretful. As a rule they are remarkably hopeful, and even when near the end cannot realize their condition, but imagine that they will recover.

The urine is more or less febrile in the early stage, and contains excess of the products of tissue-destruction. Finally it becomes watery and deficient in solids. Albumen or sugar may be present. The menstrual functions are often imperfectly performed.

Physical Signs.—The *physical signs* which may be associated with phthisis are due to:—1. Primary consolidation. 2. Softening of this consolidation. 3. Cavities in the lungs. 4. Secondary consolidation from interstitial pneumonia, which tends to produce much induration and shrinking of lung-tissue. 5. Other pulmonary affections, viz., pleurisy, bronchitis, emphysema, pneumonia, hæmorrhage into the bronchi, and pneumo-thorax. It has been customary to divide phthisis into three stages, namely, those of *consolidation*, *softening*, and *excavation*, but these are usually more or less combined, while in addition evidences of curative changes are frequently observed. The extent over which the morbid signs are perceived varies considerably, and in most cases they are present in different stages over different parts of the chest. An important character pertaining to chronic phthisis, however, is, that they tend to be localized, the rule being that they are particularly observed over one or both apices, especially in front, though not to the same degree on the two sides. But this is not always the case, and therefore it is essential to examine every portion of the thorax if there is any suspicion of the existence of phthisis; and also to make frequent examinations in order to determine the progress of the disease. It is not intended here to describe the *physical signs* in different stages, but those characteristic of cavities will be pointed out separately. It must be remembered that they will be greatly influenced by the situation, nature, and amount of the consolidation.

1. As regards *shape* and *size*, the thorax may be congenitally small, being either alar or flattened, but in many instances it is in every respect well-formed. At first there may be no local depression, or even some degree of bulging, but the tendency is for the chest to sink in in some part, especially in the supra- and infra-clavicular regions; a considerable portion of one or both sides may ultimately fall in. There is often lowering of the shoulder when one apex is involved. 2. *Local movements* are more or less deficient, especially that of expansion. 3. *Vocal fremitus* is usually increased, but may be normal or diminished. 4. *Percussion* reveals deficiency of resonance or a rise in pitch, which may culminate in the most absolute hard wooden dulness; with more or less resistance. Over the clavicles the sound is frequently purely osteal. The area of pulmonary sound is often diminished towards the neck, showing that the apex of the lung is drawn down. The effect of holding the breath after a deep inspiration will sometimes show deficient resonance where previously it could not be detected. The percussion-sound may, however, be perfectly normal in phthisis, or even unusually clear and resonant at the outset. 5. *Respiratory sounds* may be weak to complete extinction; jerky or of "cogged-wheel" rhythm; harsh with prolonged expiration; or bronchial or blowing. In healthy parts they are often puerile. 6. The *adventitious sounds* which may be heard are those indicative of bronchial catarrh or pneumonia; collapse-rhonchus in the neighbourhood of the consolidation; or dry crackling followed by moist crackling or even somewhat bubbling râles, significant of softening. 7. *Vocal* and *tussive-resonance* are usually exaggerated. 8. Localized *pleuritic friction*

or creaking is frequently observed. 9. The *heart* may be drawn up considerably, as well as uncovered by lung, so that the impulse is extensive and strong, and the sounds are loud. The better conduction of the latter towards the right infra-clavicular region than the left, is not infrequently a very useful sign of disease at the apex of the right lung. Rarely the heart is lowered, or it may be displaced laterally. 10. A *subclavian murmur* is not uncommon, especially on the left side, due to pressure on the subclavian artery. 11. The *diaphragm* and *liver* are sometimes drawn up.

Signs of cavities.—These vary considerably according to the size, shape, number, and situation of the cavities; as well as with the state of their walls, their contents, the condition of the surrounding tissue, and other circumstances. It can be readily understood that vomicæ may exist without there being any, or only doubtful evidences of their presence; and on the other hand a careless observer might mistake signs which simulate those associated with cavities; but cavities in the lungs may generally be detected when they have formed, and by careful attention to, and study of the *physical signs* present, a tolerably accurate conclusion may be arrived at as to their exact conditions, while by examination from time to time the progressive changes may be noted, excavations being thus often traced in their formation, enlargement, contraction, and final closure. The following are the important signs of cavities:—

1. *Percussion-sound* may be tubular, metallic, crack-pot, or very rarely amphoric. A rise in pitch on opening the mouth has been considered a characteristic sign of a cavity. 2. *Breath-sounds* are either blowing; or more or less hollow, ranging from tubular to cavernous or amphoric. Inspiration has a peculiar sucking or hissing character sometimes. 3. The chief significant *adventitious sounds* are large moist râles at the apices, where there are no bronchi of any size; or hollow, metallic, or ringing rhonchi, varying in size, amount, and quality, being sometimes gurgling; and very rarely metallic tinkling or amphoric echo. 4. *Vocal resonance* may have a ringing or metallic character, and is often greatly intensified. Pectoriloquy and whispering pectoriloquy are not uncommonly observed. 5. *Tussive resonance* is often painfully strong and metallic, but cough is chiefly useful in that it may cause the breath-sounds to be better heard, by clearing away secretion or emptying a cavity; or that characteristic rhonchal sounds are brought out during the act. 6. The *heart-sounds* are sometimes much intensified by transmission through cavities, and may acquire a peculiar hollow quality, or be attended with an echo. The cardiac action occasionally produces rhonchi in neighbouring cavities. 7. It is said that a *murmur* may be heard in rare instances, due to an aneurismal dilatation of a branch of the pulmonary artery.

Complications.—Numerous symptoms and physical signs which occur in the course of pulmonary phthisis are dependent upon the *complications* so often met with, some of which are due to tubercle in other parts. The chief of these include:—affections of the larynx and trachea, especially ulceration; bronchitis, pneumonia, or pleurisy; perforation of the pleura, with consequent pneumothorax; enlargement of the external absorbent glands, or of those in the chest and abdomen; tubercular peritonitis; ulceration of the intestines, especially the ileum; fatty or amyloid liver; fistula in ano; various forms of Bright's disease; diabetes; pyelitis; tubercular meningitis or tubercle in the brain; thrombosis of the veins of the leg.

COURSE—DURATION—TERMINATIONS.—The course and duration of a case of phthisis are subject to much variety. The disease may progress steadily from bad to worse, either rapidly or gradually, but more commonly there are intervals of improvement, followed by exacerbations. Some cases remain apparently in the same state for a long time; while others, even when far advanced, improve and may ultimately become practically cured. It is sometimes quite astonishing what a length of time patients will remain alive, when apparently in a moribund condition. Death may take place from gradual asthenia and hectic fever; from hæmoptysis occasionally; from some of the complications mentioned above, which generally aid in bringing about the fatal result; or from some intercurrent attack.

VARIETIES.—Different writers have classified cases of phthisis, and have attempted to indicate the clinical features characteristic of each variety. It may be useful to enumerate here the chief forms, and to point out what are the supposed clinical distinctions between certain of them, though on this matter much more extended observation is required, while they are often combined or merge into each other.

The main varieties of phthisis may be thus arranged:—

I. *Acute.* 1. Ordinary *pneumonic.* 2. *Catarrhal pneumonic* following bronchitis. 3. *Miliary* or *tubercular.*

II. *Chronic.* 1. *Pneumonic.* 2. *Catarrhal pneumonic* after bronchitis. This tends to come on insidiously, being preceded by one severe or long-continued attack of bronchial catarrh, or by several repeated attacks. The thermometer reveals more or less pyrexia. The disease is prone to be localized, and slow in its progress; while under proper treatment it shows a decided tendency towards cure, with contraction and induration of the affected part. 3. *Pleuritic.* Unquestionably phthisis may originate from simple pleurisy, leading to compression and subsequent destruction of the lung, and I think that this form of the disease deserves a special designation. 4. *Hæmorrhagic.* Two distinct meanings have been given to this term. With some it merely implies that the disease has commenced with spitting of blood, or that this is a prominent and frequent symptom in its course; with others that the hæmorrhage into the bronchi or lung-tissue has actually set up phthisis, by exciting inflammation. 5. *Fibroid.* This variety has already been fully considered. 6. *Mechanical.* Produced as the result of the constant inhalation of irritant particles, this form has several subdivisions, named according to the nature of the occupation or irritation, *e.g.*, miners', colliers', and knife-grinders' phthisis; carbonaceous phthisis, cotton-phthisis, &c. The progress is slow, the morbid process being due to a combination of chronic bronchitis, with catarrhal and interstitial pneumonia, though at last true tubercle may form. The expectoration contains more or less of the inhaled substances, sometimes in great abundance. Thus in carbonaceous phthisis or *anthrakosis* the sputa may be perfectly black; and the lungs are often observed on post-mortem examination to be in the same condition. 7. *Secondary tubercular—i.e.*, where tubercle is added to some previous morbid condition. Niemeyer has given the following signs as suggestive of the secondary development of tubercle, but justly remarks that the diagnosis is a matter of much difficulty:—great increase in dyspnœa and frequency of respiration, without any corresponding increase in physical signs; the fever becoming of a more continued type; and symptoms indicative of laryngeal complication, of intestinal ulceration, or of tubercle in other parts setting in. 8. *Primary tubercular.* Here there is no preceding bronchial catarrh. The patient may be evidently tuberculous; while the constitution is greatly affected from the outset, pyrexia of continued type and wasting being marked symptoms. Dyspnœa is often severe, with rapid breathing, but there are no adequate physical signs. Afterwards there may be evidences of inflammatory consolidation and destruction of tissues, but not to the same extent as in other forms. Soon indications of laryngeal phthisis, ulceration of the bowels, tubercular peritonitis or meningitis, or of other complications appear. The progress is generally rapid. 9. *Syphilitic.* This appears as a probable variety of phthisis, but very little is positively known about it.

Some authorities recognize scrofulous phthisis, drunkards' phthisis, and other special varieties. Among the cases which have come under my own observation, none have occurred indicating any such distinct forms of the disease.

Diagnosis.—The diagnosis of phthisis involves not only the recognition of the presence of the disease, but also as correct a knowledge as can be obtained of its seat and extent, its stages in different parts of the lungs, and its nature and origin. These questions can only be determined by a careful consideration in each case of the history, and of the existing symptoms, both local and general; and by thorough and systematic physical examination. This subject will be considered more fully later on.

Prognosis.—Those who desire full information on this important matter will find it in the valuable work of Dr. J. Pollock on Consumption. The ability to form a reliable prognosis in phthisis can, however, only be acquired by much experience and observation. There is now ample evidence to prove that phthisis may in many cases undergo a complete cure; while in a large proportion its progress may be greatly delayed by appropriate treatment, and life rendered fairly comfortable. It is difficult to lay down any average *duration* or *mortality*, these varying so much under different conditions. In endeavouring to arrive at a prognosis, the chief circumstances to be taken into account are as follows:—1. *The stage, seat, and extent of the disease.* At an early period a hopeful opinion is warranted as a rule, though at the same time it should be a guarded one. When cavities have formed the prognosis is very much worse. If the disease is limited to one apex, even should there be a cavity, recovery is not unusual; but the prognosis is more serious in proportion to the extent of the mischief, and the number of excavations, especially if both lungs are involved. Basic phthisis seems to be unfavourable. 2. *The progress of the local lesions.* Signs of rapid progress, either in the extension of the disease, or in the tendency to softening and destruction of tissues, are very unfavourable; on the other hand, if the disease is chronic or at a stand-still, or if, should a cavity have formed, there are indications that it is drying up and contracting, the prognosis is much more hopeful. Signs of considerable local consolidation and induration from interstitial pneumonia are often favourable, as showing cessation of active disease, and the advance of healing processes. 3. *Origin and nature of the disease.* Tubercular phthisis is extremely serious; when the complaint follows bronchial catarrh, or is due to certain obvious external causes, from the influence of which the patient can be removed, there is a far better chance of recovery. 4. *Constitutional condition and hereditary predisposition.* Phthisis is more dangerous if the patient is feeble and delicate, but especially if there are evidences of the existence of a tubercular or scrofulous diathesis, or if there is a strong hereditary tendency to phthisis. 5. *Local symptoms.* Continued dyspnœa; harassing cough; profuse expectoration; and severe or repeated hæmoptysis are bad indications. 6. *General symptoms.* Phthisis is dangerous in proportion to thedegree of fever; rapidity and weakness of pulse; debility and incapacity for exercise; emaciation and night-sweats. If the general condition shows signs of improvement, the pyrexia ceasing, and flesh and weight being gained, the prospect is much more hopeful. 7. *State of the digestive organs.* Inability to take food or to digest it is a most serious drawback in phthisis. Cases in which vomiting is a prominent symptom are also exceedingly unfavourable. 8. *Diet and hygienic conditions.* Deficient or non-nutritious food, and improper hygienic conditions are most injurious in cases of phthisis. This is constantly exemplified among the out-patients at the Brompton Hospital. Many of those who become in-patients revive wonderfully, as the result of the improvement in their diet and surrounding circumstances. 9. *Complications.* Many of these seriously increase the gravity of the prognosis in phthisis, and hasten the fatal result.

The question is often asked in advanced cases—How long is the patient likely to last? It is useless to attempt to give more than an approximate opinion on this point, there being so much uncertainty. The appearance of thrush is generally a sign of the "approach of the end." Another question refers to the effects of pregnancy. Usually this condition seems to delay the disease for a time, so far as I have observed; but after parturition it generally advances with increased rapidity. Marriage of persons decidedly phthisical should certainly be opposed.

TREATMENT.—The ultimate objects to be kept in view in the treatment of phthisis are:—First, its prevention and arrest; secondly, its cure; or, failing these, thirdly, palliation of symptoms and prolongation of life. Every case requires thoughtful consideration, and it must not be imagined that this is a disease capable of being controlled by any one remedy or class of remedies. An essential part of the treatment, however, is that which has for its end the maintenance and promotion of a state of general good health and constitutional vigour.

1. *General hygienic and dietetic treatment.* This is of the utmost importance, both for prevention and cure, and if it is neglected all other measures are usually unavailing. The chief things required under this head are a healthy residence, on a dry soil, in a suitable climate, elevated but well protected from cold winds, with pleasant scenery and sufficient vegetation; free ventilation, especially as regards the sleeping apartments; fresh air and exercise, so far as the powers of the system will permit; the avoidance of crowded places at night, and of all causes which are likely to excite pulmonary affections; the wearing of warm clothing, with flannel next the skin; the employment of cold baths, if they can be borne, with friction afterwards; the administration of as nutritious a diet as can be assimilated, which should contain a good proportion of fatty elements; and the avoidance of all injurious habits, such as intemperance or excessive venery. The question of climate will be separately considered. It is often requisite to enquire into the occupation of the patient, and to change this, should it entail prolonged confinement in a close room with deficient exercise, or exposure to the exciting causes of lung-diseases. At the same time the patient should, if possible, be relieved from undue mental labour or anxiety. The amount and character of the exercise to be adopted must vary in different cases, but as a rule such exercises as aid in the expansion of the chest are to be recommended, especially in young patients, though they must be kept within proper limits. Walking and riding are useful, and if these cannot be endured, passive exercise is to be enjoined, the patient being driven out daily when the weather permits, so that at least a proper supply of fresh air may be obtained. At the same time over-fatigue must be avoided. Certain acts which call into exercise the muscles of respiration are often beneficial if duly regulated, such as taking deep inspirations, reading aloud, or moderate singing. Anything that interferes with the freedom of the respiratory movements, as the pressure of tight stays or a bent position, ought to be forbidden. Milk is a most valuable article of diet, and some practitioners consider asses' or goats' milk specially efficacious. Whey has also been well spoken of. In many cases a little wine or beer is very beneficial.

2. In all cases where there is any fear of phthisis setting in, attention should be paid to the slightest indication of pulmonary disorder. Should the complaint be acute in its origin, and of an inflammatory nature, the measures already mentioned when treating of the different forms of pulmonary inflammation must be had recourse to. Further, any acute exacerbation should receive immediate attention; but at the same time it is very important in most cases to avoid lowering measures, and to preserve the strength as much

as possible, rest in bed being enjoined. Of course everything which is likely to excite irritation in connection with the lungs must be strictly guarded against.

3. Before proceeding to the active treatment of any case of phthisis, it is of the greatest consequence to look to the state of the *digestive organs.* Unless digestion is carried on properly, all other means are of no avail; and here it must be mentioned that regularity of meals and other matters upon which healthy digestion depends should receive due consideration. If any form of dyspepsia is present, the appropriate remedies must be administered. Should there be signs of gastric irritation, a combination of *bismuth* with an *alkaline carbonate* and *hydrocyanic acid* proves very beneficial. In the early period the bowels are often confined, and some mild aperient must then be given, so that they may be opened daily.

4. Various tonic and other medicines which improve the condition of the general health and the quality of the blood, are very serviceable in phthisis. Of these the principal are the *dilute mineral acids—nitric, hydrochloric, sulphuric,* or *phosphoric; quinine;* different preparations of *iron,* especially if the patient is anæmic; *salicine; strychnia;* and vegetable bitter infusions or tinctures, such as those of *gentian, calumba, chiretta, quassia,* or *cascarilla.* These may be given in various combinations.

5. Among the many special therapeutic agents recommended for phthisis, *cod-liver oil* holds the first position. Almost universal experience has testified to its good effects in this disease. It is needless to enter here into the question of its mode of action, but certain matters of practical importance as regards its administration must be mentioned. Only a small dose should be given at first, not too often repeated. A teaspoonful once or twice a day is sufficient to commence with, the dose being increased by degrees to a tablespoonful three times daily. It is seldom desirable to exceed this quantity. Most patients take the oil best immediately or soon after meals, and if it tends to disagree, lying down for a short time after taking it will not infrequently prevent any ill effects. Some can manage it best when going to bed at night. It is always well to make use of some vehicle for administering the oil, even when it can be taken alone, but the quantity of this should not be large. It may in many cases be given with the mixture, if this is of a bitter or acid nature; or with steel-wine. Milk, orange wine, frothy stout or ale, or a little cold brandy and water are among the most useful vehicles. When the oil repeats or causes sickness, it is often well borne when given with lime-water and milk in equal parts, some of which may also be drunk after it. Small doses of *strychnine* have been found very useful in preventing the nauseating effects of the oil. It is most important to look to its quality, especially at the outset, otherwise a patient may get an unsurmountable antipathy to it. Different varieties are preferred by different practitioners. A good pale oil seems to answer best generally; many patients like De Jongh's pale-brown oil very well. Regularity and perseverance in the use of the remedy are essential in order to realize the effects which it is capable of pro-

ducing. During its administration the diet must be carefully attended to, and should not be of too rich a character. If from time to time it appears to disagree with the digestive organs, it may be temporarily omitted, especially during the warmer months. It has been recommended to introduce cod-liver oil by inunction or enema, but though necessary under some circumstances, these modes of administration are objectionable as a rule. Inunction is often advantageously employed in children. Several preparations containing cod-liver oil have been made, such as the *etherised oil;* or a combination with *quinine, hypophosphite of lime,* and other remedies.

Numerous substances have been advocated as substitutes for cod-liver oil, but they are far less efficacious. The chief of these are olive-oil; skate, shark, or dugong oils; cocoa-nut oil; dog's fat; glycerine; and cream. The last two certainly produce good effects in some cases.

Space will only permit the enumeration of some other special remedies recommended. The principal are *pancreatic emulsion; hypophosphites of lime, soda,* and *iron; phosphate of lime; extract of malt; iodide of potassium; sulphurous acid* and *sulphites; arsenic;* and *koumiss.* These have been very differently reported upon by different observers, and though most of them are useful in certain cases, they are by no means to be looked upon as specific remedies.

6. *Local treatment.*—Applications to the chest are decidedly useful in many cases of phthisis, either for the relief of symptoms, or for the subdual of inflammatory processes; or possibly they may have an immediate effect on some forms of the disease. The most useful are small or flying blisters; applications of *iodine,* more or less powerful; and liniments of *croton oil, turpentine,* or *acetic acid.* Local removal of blood is decidedly but seldom desirable. In acute exacerbations fomentations and poultices are often required. In some cases the application of strapping over parts of the chest, in order to procure mechanical rest, has a beneficial effect as regards the progress of phthisis.

7. *Treatment of symptoms and complications.*—Various symptoms frequently need attention during the course of a case of phthisis, but it is impossible to do more here than point out their nature, and suggest the indications for their management, most of them being considered in detail in other parts of this work. Pyrexia must be subdued, especially if it is inclined to be high. *Quinine* in full doses combined with *digitalis* may be given for this purpose. Dr. C. Theodore Williams has found cold baths beneficial in some cases. Debility and wasting will be counteracted by the general treatment already described, as well as by subduing the fever. When there is much exhaustion, considerable quantities of alcoholic and other stimulants are required. For night-sweats the chief remedies are *oxide of zinc,* gr. ij—v, in the form of pill or powder given at night, which may be combined with *extract of belladonna* or *morphia; tincture of belladonna,* or subcutaneous injection of *atropine;* or a full dose of *quinine* or *gallic acid.* Subcutaneous injection of *ergotine* has also been advocated. In some cases I have found that the

night sweats were best checked by the administration for a few days of a mixture containing *quinine*, *alum*, and *dilute sulphuric acid*. Sponging the upper part of the body carefully with vinegar and water is sometimes useful. Pains about the chest are often relieved by the local applications already mentioned, or by wearing some anodyne or warm plaster; in a considerable number of cases much pain in the side is complained of from time to time, either muscular or pleuritic, and this is almost invariably at once relieved by strapping the side properly, as described under pleurisy, which is the plan of treatment I always adopt under such circumstances. Cough is often a most troublesome symptom in phthisis. It is by no means always desirable to stop it, but its management must be guided by the amount of expectoration, the discharge of which is to be encouraged, or its amount diminished, by means of remedies mentioned under bronchitis. In most cases cough needs to be relieved, and it is always advisable first to look to the state of the throat and larynx, as cough is very commonly due to some unhealthy condition of these parts. Local applications of *tannin* or *chlorate of potash;* or various astringent gargles or lozenges are often most beneficial. If the cough is irritable, anodynes are valuable, especially *opium*, *morphia*, *codeia*, *hydrate of chloral*, *croton-chloral*, *bromide of ammonium*, *conium*, *belladonna*, or *chlorodyne*, some of which may be combined. These are best given in the form of lozenges, syrups, or linctuses, and it is desirable to make all cough mixtures as small as possible. *Tincture of gelseminum* has been recommended for the relief of cough in phthisis. Anodyne and other inhalations are in many cases extremely serviceable, but not on account of any curative influence upon the disease. They are particularly useful if the larynx is affected. If the expectoration is fœtid, disinfectant inhalations should be employed. Weak iodine inhalations are sometimes decidedly beneficial. Dyspnœa and hæmoptysis must be treated according to the ordinary principles. Vomiting is sometimes a very distressing symptom; if the ordinary remedies fail, small doses of *strychnia* should be tried, and its effects are in some cases most satisfactory. Diarrhœa, if due to ulceration of the bowels, is frequently very difficult to check. *Carbonate of bismuth*, gr. v—x, with *Dover's powder*, gr. iij.—v, is often a useful combination; but enemata of *starch* and *opium* are most to be relied upon. Other complications must be attended to as they arise.

8. *Change of climate, and sea-voyages.*—This is a most important subject in connection with the treatment of phthisis, and for detailed information the reader is referred to the writings of Williams, Walshe, Henry Bennett, and others. In selecting a suitable climate, the chief points to be observed are that it is not liable to either extreme of temperature; that the air is pure and not too moist; that the soil is healthy; and that there is no likelihood of sudden changes, of exposure to cold winds, or of continued unfavourable weather. It is always well also to choose a place rendered attractive by bright sunshine, pretty scenery, and pleasant company. One most important object to be kept in mind in selecting a climate is, that the patient may be enabled to be out in the

open air as much as possible. The salutary influence of high altitudes upon phthisis has been well established, and some authorities recommend a residence in mountainous districts, even during the winter. It is questionable, however, whether this is desirable, but patients should rather reside in some warm and sheltered place during the colder months, and go to a high and dry region during the warm season. The exact qualities of the climate which are suitable for any individual case will depend upon its mode of origin, and upon the conditions of the bronchial mucous membrane. Those cases which are of constitutional origin are particularly benefited by a sojourn in lofty regions. The principal sea-side places suitable for phthisical invalids are the Isle of Wight, especially Ventnor, Bournemouth, Torquay, Hastings, St. Leonards, Penzance, Worthing, Sidmouth, Southport, Grange, Clevedon, and Tenby, in this country, where the temperature is moderate, but moisture considerable; Mentone, Nice, San Remo, Palermo, Cannes, Malaga, Malta, or Algiers, where there is a high temperature, with but little moisture; Madeira, West Indies, and the Azores, where both temperature and moisture are considerable. Among inland regions, Pau, Pisa, Upper Egypt, Syria, Australia, and certain parts of South Africa are recommended; or if elevated districts are desired, the Alps, Andes, Himalayas, or the Mexican mountain ranges afford the requisite conditions.

Long voyages, especially to Australia or up the Mediterranean, are most useful in many cases, but they should not be recommended if the disease is too far advanced.

A large number of patients are unable to avail themselves of the benefits to be derived from a suitable climate, though thanks to the various hospitals established in many sea-side places in this country, these advantages are more widely disseminated at present than they were formerly. If during the winter months patients are prevented by circumstances from residing in a proper climate, they should keep indoors as much as possible in bad weather and at night; avoid every cause of cold; and wear a respirator. Men should allow the beard and moustache to grow.

9. *Special* treatment of consumption by mineral waters, compressed air, inhalation of oxygen, and various other methods, does not seem to have been attended with much success.

Chapter XV.

CANCER OF THE LUNGS.

Ætiology.—This disease, which is exceedingly rare, is far most common from 40 to 60 years of age; and more males are affected than females. It may be inherited. In the large majority of cases pulmonary cancer is secondary, especially to cancer of the bones or testicles, but it may result from direct extension, or be primary in its origin. The morbid condition generally extends so as to involve neighbouring parts; but is very rarely followed by secondary cancerous formations in other internal organs.

Anatomical Characters.—*Encephaloid* is the variety of cancer usually found in the lungs, and it is often extremely soft, pulpy, and vascular. Other forms are occasionally met with, alone or in combination; and considerable deposit of black pigment may be observed, constituting *melanotic* cancer.

Secondary cancer assumes almost always the nodular form, and affects both lungs; the nodules vary much in size, and when situated at the surface tend to be depressed; by their union a lung may be involved throughout. *Primary* cancer is particularly prone to be confined to one lung, especially the right, and is often infiltrated. After a time the cancerous matter undergoes fatty degeneration and softening, cavities being formed in some cases, and extravasations of blood into the substance of a growth are common. The vessels and bronchi are often either involved in the disease, or obliterated by pressure. The unaffected portions of the lung-texture may be normal, or various morbid changes may be set up. A cancerous lung feels remarkably heavy. Extensive pleuritic adhesions are usually observed.

Symptoms.—Secondary cancer tends to come on insidiously, without any subjective symptoms. I have seen a case in which the left lung was involved almost throughout, and the right also extensively, the only symptoms being occasional cough, with shortness of breath on exertion. In primary cancer there is usually pain in the chest, which may be extremely severe, of a lancinating character, and accompanied with tenderness. Cough is usually present, attended in some cases with a peculiar expectoration, in the form of a substance resembling red or black-currant jelly, or occasionally containing cancer-elements. Hæmoptysis is very common. Dyspnœa is generally observed, being especially severe if there are projecting nodules pressing on the nerves, or if the cancer is associated with a mediastinal tumour, when other signs of pressure on neighbouring structures are observed.

The general symptoms are not usually so marked as might be expected. The cancerous cachexia may or may not be evident. Emaciation, fever, night-sweats, and failure of strength are generally present more or less, but they may be comparatively very slight, especially in cases of secondary cancer. Wasting is sometimes extremely rapid in its progress when it has once commenced.

Physical Signs.—These will vary according to the form, seat, and amount of the cancerous accumulation; and whether it is associated with a mediastinal tumour or not. Where there are scattered nodules, there may only be slight alterations in the percussion and respiratory sounds. If a lung is extensively involved with *nodular* cancer, being ultimately converted into a mass of encephaloid, the signs are:—Enlargement of the chest on the affected side, with widened and flattened spaces, the surface feeling unusually even, but without any sense of fluctuation; great deficiency or entire absence of movement; weakened or annulled vocal fremitus; absolute dulness, unaltered by position, with great sense of resistance; weakened or absent breath-sounds over a variable area; deficient vocal resonance; displacement of heart or diaphragm, the cardiac sounds being frequently conducted with an unusual degree of intensity. In the *infiltrated* form the lung is contracted, and physical examination reveals:—Retraction of the side, with depression of the intercostal spaces; deficient movement, the spaces still acting, however; increased, diminished, or absent vocal fremitus, according to the amount of consolidation; hard, wooden, high-pitched, or tubular percussion, which may extend across the middle line; bronchial, blowing, or feeble respiratory sounds; often intensified vocal resonance; displacement of the heart, either towards the affected or the opposite side, with intensification of the sounds; and drawing up of the diaphragm. Ultimately there may be signs of cavities. In the non-cancerous parts signs of hypertrophy, bronchitis, emphysema, or collapse are usually present.

PROGNOSIS is necessarily fatal, death occurring either from local or general causes.

TREATMENT can only be palliative, the usual remedies being employed for the relief of symptoms as they arise.

RARE MORBID FORMATIONS IN THE LUNGS.

It will be only necessary to enumerate certain morbid formations which may exceptionally be met with in the lungs, viz.: hydatids; sarcomatous, enchondromatous, osteoid, or myeloid tumours; and hæmatoma.

CHAPTER XVI.

DISEASES OF THE PLEURA.

I. PLEURISY.—INFLAMMATION OF THE PLEURA.

ÆTIOLOGY.—*Exciting causes.* The causes of pleurisy may be enumerated as:—1. *Direct irritation* of the pleura, from injury; foreign matters which have gained access into its cavity, *e.g.*, pus or air; local deposits in the pleura, such as cancer or tubercle; diseased bone; friction or pressure by tumours. 2. *Cold* or other injurious meteorological influences, though many deny any such mode of causation. 3. Possibly "extreme muscular over-exertion and exertion in continuous public speaking" (Anstie). 4. *Extension* from neighbouring parts, *e,g.*, the pericardium; under which class of causes may be also mentioned the pleurisy which accompanies pneumonia in most cases, or which complicates other pulmonary affections, especially phthisis. 5. *Blood-poisoning*, in connection with various acute febrile diseases, especially scarlatina, typhoid, puerperal fever, or acute rheumatism; pyæmia and septicæmia; Bright's disease; or alcoholism.

According to its mode of origin pleurisy has been divided into *primary* or *idiopathic*, and *secondary*. The former is due to some cause acting immediately on the pleura, the patient having previously been in good health; the latter is the result either of some constitutional affection, or of previous visceral organic disease. In the latter case, however, it is not improbable that the inflammation may in some instances be brought about by a slight exciting cause, acting on a depraved constitution which greatly predisposes to serous inflammations. Of other *predisposing causes* but little is known. Pleurisy may occur at any age. Probably it is most common in the colder seasons.

Anatomical Characters.—Like other inflammations of serous membranes, pleurisy, if it is at all extensive and runs a regular course, is characterized by the stages of vascularization; lymph-exudation; fluid-effusion; absorption; and adhesion. The costal pleura seems to be first affected as a rule. At the outset the anatomical characters include bright redness from capillary injection, often with spots of extravasation; dryness and loss of polish of the membrane; with thickening, cloudiness, and diminution in consistence. Then exudation covers the surface more or less extensively, varying in quantity and characters, and being usually stratified. A sero-fibrinous fluid begins to accumulate in the pleural sac, in some cases from a very early period, in which float fibrinous flocculi, its amount varying exceedingly, and it may be so abundant as to fill the sac completely. More or less blood may be present, as well as gas, the latter being probably due to decomposition. The epithelial cells of the membrane undergo proliferation, and the newly formed cells are seen in the exudation and fluid. If the termination is favourable, the effusion is absorbed, much of the exudation is also taken up after undergoing degenerative changes, while the remainder becomes organized into adhesions or agglutinations, these also sometimes developing from papillary vascular growths which arise from the sub-epithelial tissue.

In some cases, owing to an unhealthy condition of the system or to excessive formation of cells, the fluid is not absorbed; but remains and becomes more or less purulent. The exudation may also become caseous, and may thus lead to the formation of tubercle; or calcification sometimes occurs.

The lung, if not previously consolidated, is first floated forwards and relaxed, and afterwards compressed, until ultimately it becomes completely carnified. If the pressure is soon removed, the lung will expand again; otherwise it is in danger of being rendered permanently useless, or of undergoing further destructive changes.

In a good proportion of cases pleurisy is limited to a very small patch, which is covered with a slight exudation, and an adhesion soon forms. In a few instances I have observed distinct evidence of extensive formation of lymph, with little or no fluid effusion. Sometimes the serum is "loculated" by adhesions. Rarely pleurisy is bilateral, being then generally associated with some constitutional diathesis.

By *chronic pleurisy* is usually meant either extensive adhesion of the pleural surfaces, with falling-in of the side, the result of an acute attack; or a condition in which the effusion remains and cannot be absorbed, being either serous or purulent, and in either case named *empyæma;* or where an opening has been formed, through which there is a permanent discharge, either externally—*fistulous empyæma*, into the bronchi, or, very rarely, into the bowels. Occasionally the disease seems to be chronic in its origin, especially when of a secondary nature; under this class of cases of pleurisy might also be included those in which there is a tendency to repeated limited attacks.

If there is abundant effusion, the neighbouring organs will be found displaced, especially the heart in cases of left pleurisy. This is partly due to pressure; partly to elastic traction on the part of the lung which is free to act. Dr. Douglas Powell affirms that the axis of the heart can never diverge beyond the vertical line, or only to a very slight degree, so that the apex does not point to the right, which is contradictory of the statements made by other observers. The right side of the heart and general venous system are often overloaded.

SYMPTOMS.—In all serous imflammations the symptoms observed are of three kinds, viz., first, those directly due to the affection of the membrane itself, and of the tissues immediately adjoining; secondly, those resulting from the mechanical pressure of the inflammatory products on neighbouring organs and structures; and thirdly, those indicating constitutional disturbance. Much variety is presented in the intensity of the symptoms of pleurisy, and that by no means always in proportion to the gravity of the attack. In many instances, which are common enough in hospital outpatient practice, where the disease is localized in a small patch, the one prominent symptom is a "stitch in the side," which may be very severe, increased by breathing deeply or coughing, as well as often by pressure, the patient leaning towards the affected side, which is kept as much at rest as possible. There are no general symptoms.

A typical case of acute primary pleurisy with effusion has the following clinical history. At the outset several chills are generally felt, not of a severe character; accompanied or soon followed by certain *local* and *general* symptoms.

Local.—Acute pain is felt, usually in the infra-mammary or infra-axillary region, of a dragging, catching, or stitch-like character, increased by breathing or coughing, and attended with superficial or deep tenderness. The sharpness of the pain is often evidenced in the expression, posture, and mode of breathing of the patient. Respiration is carried on in a hurried, shallow, and irregular manner, but there is no actual dyspnœa at first, and the number of respirations is rarely above from 30 to 35. Later on evident dyspnœa is observed, should much fluid be poured out, which varies in its degree, being in some cases very severe. Cough is generally present, though the patient tries to repress it; it is short and hacking, generally dry, or at least unattended with any particular expectoration. Sometimes a cough is excited by making the patient sit up or bend forward. At first the patient usually prefers to lie on the affected side, but later on there is no uniformity, for it is not uncommon to see patients with one pleura full of fluid habitually rest on the healthy side.

General.—Pyrexia is observed, but it is not very marked, and the temperature has no typical course. The pulse is frequent, varying usually from 90 to 120, full and bounding, but deficient in resistance, as evidenced by the sphygmograph (Anstie). The pulse-respiration ratio is altered somewhat, but not to any great degree. There is very little prostration. Disturbance of the digestive organs, headache, and other symptoms associated with the febrile state are present more or less. The urine may be slightly albuminous.

COURSE AND PROGRESS.—In favourable cases the symptoms subside in a few days, and the fluid is absorbed. Should this not happen, the only remaining symptom in many cases is a little dyspnœa. Ultimately the effusion may in time be taken up, or be discharged through the bronchi or externally, unless it is removed by operation. In cases of *chronic effusion* pyrexia often continues, the skin being hot, dry, and harsh, and the pulse frequent but weak. The patient wastes and becomes much debilitated. Œdema of the affected side, and extreme clubbing of the finger ends are sometimes noticed. *Fistulous empyœma* is generally attended with great weakness, loss of flesh, and a tendency to hectic fever. The hair frequently falls off. Ultimately symptoms of phthisis or tuberculosis may arise. The formation of pus has been supposed to be indicated by repeated rigors, but certainly this is not always the case. Perforation into the bronchi is attended with profuse expectoration of matter. Should extensive adhesions form, with retraction of the side, more or less shortness of breath remains, with a liability to pains on the side affected, and more or less debility.

It is very important to notice that extensive effusion may be poured out when there have been no particular symptoms to draw attention to the chest—*latent pleurisy*; and this is especially liable to happen in secondary pleurisy, or when the complaint occurs in children. *Bilateral pleurisy* is necessarily a serious condition, and is attended with dangerous dyspnœa: *Diaphragmatic pleurisy* probably gives rise to very severe pain; and also interferes greatly with the act of breathing.

PHYSICAL SIGNS.—In the early stage of pleurisy the only reliable physical signs are:—1. *Diminished movements* on the affected side, on account of pain. 2. *Friction-fremitus*, which is exceedingly rare. 3. *Friction-sound*, at first slight and grazing, but becoming much louder when lymph is formed. It may be limited to a small spot; or be heard more or less extensively over the side.

The signs attending the stage of *fluid-effusion* are usually quite characteristic, being, however, considerably modified by its quantity and mode of accumulation. Usually the evidences of effusion are first observed over the lower part of the chest, and they extend upwards more or less rapidly. 1. The side is *enlarged* to a variable degree, and the spaces are often specially affected, being either flattened or bulged out. It is important to make use of the *cyrtometer* in determining this enlargement, as the measurement may be actually less on the affected than on the healthy side. 2. *Movement* is diminished or almost completely annulled. 3. *Vocal fremitus* is deficient or absent below, in excess above; there being frequently an abrupt transition from the one condition to the other, particularly in front. 4. *Fluctuation* may occasionally be detected. 5. *Percussion-sound* is dull over the area of the fluid. Beginning below, the dulness may ultimately extend over the whole side, and beyond the middle line for some distance. If the patient has assumed the recumbent posture at an early period, dulness is sometimes noticed over the whole of the back before any alteration in percussion-sound is observed in front. It may be movable with a change of posture of the patient, but frequently this is not the case. In many instances an abnormally clear or tubular sound can be elicited under the clavicle at a certain stage, and the transition from dulness to this sound may be quite abrupt; occasionally the percussion here simulates crack-pot sound. 6. *Breath-sounds* are absent or feeble below: exaggerated or even blowing or tubular above. 7. *Friction-sound* may or may not be heard at the margin of the dulness. 8. *Vocal resonance* is diminished or annulled below, increased above, the change from the one to the other being often marked. Ægophony is heard in some cases, especially about the angle of the scapula. 9. *Displacement of organs* is an important sign of pleuritic effusion, especially of the heart. Its impulse may be noticed far over on the right side in cases of left pleurisy, while its sounds are very loud here. The impulse, however, is probably connected with the right ventricle. The diaphragm, with the liver, spleen, or stomach, may also be depressed, Some cases have come under my notice in which a cardiac murmur seemed to be due to displacement. 10. Rarely *succussion* gives rise to a splashing-sensation or sound, owing to the presence of air in the pleura.

Absorption may be traced by the gradual subsidence of the signs described, and their restoration to the normal; often accompanied with the development of a loud *redux friction-sound*, and sometimes with *friction-fremitus*. Dulness may continue for some time. In favourable cases the side resumes its proper form and size, and the lung expands. The heart occasionally remains in its abnormal position, owing to adhesions; or goes too far in the opposite direction; or lies more or less loose in the chest. Should the lung remain unexpanded the signs are:—1. *General retraction* of the side, the ribs being crowded together; the shoulder lowered; all the diameters of the chest diminished, especially the antero-posterior; and the spine curved, usually to the diseased, occasionally to the healthy side. 2. *Movements* null or greatly lessened. 3. *Deficient resonance* on percussion. 4. Feeble *respiratory sounds* over the side generally; or in some parts of bronchial quality. *Fistulous empyæma* is followed by extreme retraction of the side. If the lung is permanently condensed, signs may subsequently be noticed indicating that it has undergone destructive processes.

The signs of fluid are now and then observed on both sides. On the other hand they are limited in the *loculated* variety of pleurisy, which may cause local bulging. The fluid sometimes makes its way to the surface, and even points like an abscess; or in rare instances it exhibits pulsation when in the neighbourhood of the heart. Should an empyæma open into the bronchi, râles will be heard over the lung, and sometimes pneumothorax is produced. In diaphragmatic pleurisy there may be no physical signs, except cessation of all abdominal movements during respiration.

In children some important modifications of the ordinary physical signs are noticed. The chest, being very yielding, is dilated considerably and at a very early period, while the organs are comparatively less displaced than in adults. Bronchial breathing and vocal resonance often persist even when the thorax is full of fluid.

Old adhesions resulting from previous attacks may influence the signs of pleurisy considerably; as well as morbid conditions of the lung with which it may be associated.

TERMINATIONS.—1. *Recovery* takes place in a large proportion of cases of pleurisy, after absorption or removal by operation of any fluid, the lung expanding fairly, but being more or less adherent. 2. *Death* is a rare event in acute cases, unless the pleurisy is bilateral, or is associated with some serious constitutional or local disease. It may happen, however, from the mere mechanical effects of the fluid-effusion, accompanied with pulmonary congestion and œdema, and there is a danger of sudden death should there be great dyspnœa. 3. Transition into *chronic pleurisy* is not uncommonly observed. Under this would be included—*a.* Chronic effusion. *b.* Retraction of the side from extensive adhesions, with permanent binding down of the lung. *c.* Chronic purulent discharge, either by an external opening; through the air-passages; or in some unusual direction, such as into the intestines. In these cases the patient may ultimately either sink from gradual asthenia, or may become phthisical; or sometimes recovery follows, though with permanent loss of the use of the lung on the affected side.

DIAGNOSIS.—This subject will be again considered, and here it need only be mentioned that pleurisy has not merely to be distinguished from other affections of the lung or pleura, but that it may be simulated at first by painful affections of the chest-walls; or, in the stage of fluid-effusion, by enlargements of the liver or spleen, hydatids of the liver, or a large tumour within the chest. Careful *physical examination* has mainly to be relied upon in diagnosis.

PROGNOSIS.—This involves not only the immediate result of the disease, but also its ultimate issue. Primary pleurisy ought to terminate favourably in the great majority of cases, if properly managed. It is more serious in proportion to the amount of fluid poured out; to the time that it has remained in the pleura; and to its tendency to become purulent. Severe dyspnœa is a dangerous sign. The thermometer and sphygmograph may be of use in aiding towards a prognosis. Pleurisy secondary to constitutional diseases is very grave; also when it occurs in advanced cases of chronic alcoholism. Bilateral pleurisy with effusion is necessarily most dangerous.

The different forms of chronic pleurisy are often unfavourable. Discharge of pleuritic fluid through the lungs is generally a most untoward termination, but I have known a case do remarkably well after this event. It must be remembered that when pus forms, or when caseous degeneration is proceeding, there is a danger of tuberculosis being set up; and also that the lung may undergo destructive processes.

TREATMENT.—The activity of the measures to be adopted in the management of pleurisy must differ greatly in different cases, and I strongly protest against any routine practice of removing blood, blistering, and administering mercury in this disease, which, whatever may be said to the contrary, is even at the present day by no means an uncommon mode of practice. The ultimate objects to be kept in view are not merely to save the patient's life, but to restore the parts affected to as normal a condition as possible.

The principles to be kept in view in the treatment of pleurisy are:—1. To subdue the inflammation, and diminish the amonnt of lymph and fluid poured out. 2. To promote the absorption of these materials as rapidly as possible. 3. To remove them in some other way if they cannot be absorbed. 4. To relieve symptoms. 5. To support the strength of the patient.

1. The first thing which is attended to in the treatment of inflammation of synovial as well as of most serous membranes, is to keep the structures affected in as complete a state of *rest* as can be obtained. It appears to me that this should also be the primary object to be kept in view in the management of pleurisy. For some years I have been in the habit of paying special attention to this matter, by mechanically fixing the side affected, and thus limiting or preventing its movements, and am firmly convinced of the beneficial effects resulting therefrom. The following is the method which I now adopt for the purpose of procuring the desired rest:—Strips of a properly-adherent plaster spread on some thick material, from three to four inches wide and of sufficient length, are applied round the affected side from mid-spine to mid-sternum or a little beyond. These are laid on over a variable extent of the chest, according to the requirements of the case, it being sometimes necessary to include the whole side. It is best to make the application from below upwards, and to fix the strips of plaster in an oblique direction rather than horizontally. The patient being directed to expire deeply, a strip is fixed at mid-spine and drawn tightly, firmly, and evenly round the side in the direction of the ribs, *i.e.*, a little obliquely from above downwards and forwards; then another strip is laid on across this, also extending from mid-spine to mid-sternum, but in the opposite direction to the first, *i.e.*, obliquely upwards and forwards across the course of the ribs; the third is to follow the direction of the first, overlapping about half its width, the fourth that of the second, and so on in alternate directions until the entire side is included if required. Finally it is often desirable to apply over the whole two or three strips horizontally, so as to form a superficial layer, and one or two may also be passed from behind forwards over the shoulder, these being

kept down by another strip fixed round the side across their ends. The good effects realized by this method of treatment, when efficiently carried out, have been as follows:—1. In cases of limited dry pleurisy, which are very common, especially in connection with phthisis, as well as exceedingly distressing, it gives almost invariably complete and immediate relief, so that patients can breathe and cough comfortably, and are able to follow their occupations without discomfort, which is particularly important in the case of those who are obliged to work. 2. It is reasonable to suppose that the quantity of inflammatory products poured out will be limited by maintaining the parts in a state of rest. I have every reason to conclude that this result was realized in several instances which have come under my notice. 3. The rest and pressure may also aid absorption, and I have found this mode of treatment decidedly efficacious in aiding towards the removal of moderate pleuritic effusion. 4. Occasionally cases of pleurisy come under observation, in which there is extensive exudation of lymph, with little or no fluid, and this remains as a chronic condition, causing palpable fremitus, attended with most unpleasant sensations to the patient. The only curative end that can be attained is to bring about adhesion of the surfaces of the pleura, and strapping the chest will most certainly effect this purpose.

Venesection or even local bleeding is, in my opinion, scarcely ever required in pleurisy. *Calomel* is a drug which had better be avoided, except as an aperient. Many cases require nothing but rest, but if the attack is severe, the best therapeutic agents at the outset are those which lower the cardiac action, such as *aconite*, *veratrum*, or *tartar-emetic* in small doses, which may be given in some saline mixture. *Opium* is most valuable for the purpose of relieving pain and procuring sleep, *Dover's powder* being a very useful preparation; or *morphia* may be injected subcutaneously. The application of cold to the chest has been recommended.

2. Should there be much effusion—and this is not infrequently the condition detected when the patient comes under observation—free counter-irritation over the chest may prove decidedly beneficial, by means of repeated blisters, or by the application of iodine liniment. I have met with several instances in which strapping the side has certainly appeared to aid absorption, when the fluid was not abundant. Medicines which act on the skin, bowels, or kidneys are those which are believed to be most efficient in promoting absorption. Full doses of *iodide of potassium*, with *infusion of digitalis* and other diuretics are sometimes beneficial. Powerful purgatives are of questionable value, and should be employed with caution if at all, but the bowels should be kept freely opened. Repeated vapour or hot-air baths have proved serviceable in some instances under my care. Dr. Anstie strongly recommended *tincture of iron*, and this is certainly a valuable remedy in many cases.

3. A most important mode of treating many cases of pleuritic effusion consists in the removal of the fluid by *paracentesis thoracis*. Formerly this measure was merely adopted as a last resource; now it ought to be looked upon as a legitimate and most valuable

method of treatment. Many questions connected with this subject are still matters of dispute, such as the time at, and circumstances under which the operation ought to be performed; the instrument to be employed; the amount of fluid to be removed; and whether it is dangerous or not to allow the entrance of air into the pleura. There is ample evidence to prove the great value of paracentesis, even in acute cases, especially in the treatment of children, and I can add my personal testimony in favour of this measure. In the late Dr. Anstie's excellent article on pleurisy, in "Reynolds' System of Medicine," the circumstances under which paracentesis ought to be performed are summed up as follows:—1. In all cases of pleurisy, at whatever date, where the fluid is so copious as to fill one pleura, and begins to compress the lung of the other side. 2. In all cases of double pleurisy, when the total fluid may be said to occupy a space equal to half the united dimensions of the two pleural cavities. 3. In all cases where, the effusion being large, there have been one or more fits of orthopnœa. 4. In all cases where the fluid can be suspected to be pus, an exploratory puncture must be made; if purulent, the fluid must be let out. 5. In all cases where a pleuritic effusion occupying as much as half of one pleural cavity has existed so long as one month, and shows no sign of progressive absorption.

Ordinarily the fluid is best taken away by means of the *aspirateur*. In exceptional cases the *trochar* and *canula* must be employed. It is not necessary to remove the whole of the fluid, provided it is not purulent. It is probably safer to exclude air, if possible. If a fistulous opening remains, and fœtid pus escapes, the cavity of the pleura should be washed out from time to time with luke-warm water, which may contain some disinfectant, such as a little *carbolic acid*, or *tincture of iodine* (1 part to 4).

4. The chief *symptom* likely to call for special attention is pain in the side. If not relieved by rest, the best plan is to employ subcutaneous injection of *morphia*. If the side is not strapped, the application of hot fomentations, linseed-meal poultices, or sinapisms may be tried. Urgent dyspnœa calls for paracentesis usually. Cough must be relieved, if troublesome, by sedative remedies.

5. Patients suffering from pleurisy need not be kept low as regards diet, but stimulants are not to be given at first. If the strength fails, and especially in the chronic form of the disease, abundant nutritious food is required, with wine or beer. *Quinine*, *mineral acids*, *cod-liver oil*, and other remedies of this kind are also very useful at this time.

6. The treatment of *secondary pleurisy* must be guided by the condition with which it is associated. Lowering measures are especially to be avoided in these cases.

II. HYDROTHORAX.—DROPSY OF THE PLEURA.

ÆTIOLOGY.—Hydrothorax is almost always a part of general dropsy from cardiac or renal disease. The effusion is said to be in rare instances of an active kind, associated with cancer or tubercle.

ANATOMICAL CHARACTERS.—More or less clear serous fluid is found in both pleural sacs, compressing the lungs. No signs of inflammation are present.

SYMPTOMS.—Dyspnœa, with signs of deficient blood-aëration, are the only symptoms of hydrothorax, resulting from mechanical interference with the action of the lungs; and there is generally much distress, because this condition is added to some previous serious affection, and because both sides are involved. The *physical signs* are those of fluid in both pleuræ; not excessive in amount; freely movable; without friction-sound or fremitus; while there is no displacement of the heart.

TREATMENT.—As a rule this is merely a part of the general treatment for dropsy. Dry cupping over the chest may be employed with advantage in some instances. In extreme cases paracentesis might be indicated, in order to afford temporary relief.

III. HÆMOTHORAX.—HÆMORRHAGE INTO THE PLEURA.

ÆTIOLOGY.—More or less blood may be mixed with pleuritic effusion of inflammatory origin; or with the ordinary serum, should there be a scorbutic or purpuric tendency. The accumulation of blood in any quantity in the pleura, however, is due to one of the following causes:—1. Rupture of a vessel from injury, or its perforation during operation. 2. Bursting of an aneurism, of which I have seen a most interesting example, in which an aneurism of the aorta between the pillars of the diaphragm ruptured into the left pleural cavity. 3. Carcinoma of the lung giving way into the pleura. 4. Diffuse pulmonary hæmorrhage extending to the surface of the lung. 5. Cancer of the pleura itself.

SYMPTOMS.—Dyspnœa is felt, owing to the pressure of the blood upon the lung; this being accompanied with evidences of loss of blood. Death may occur very speedily. The *physical signs* are merely those of pleuritic accumulation, either liquid or solid, according as the blood remains fluid or coagulates.

TREATMENT.—In most non-traumatic cases of hæmothorax nothing can be done but to keep the patient at rest. Of course if the bleeding is due to injury, it is necessary to try to stop it by surgical means. Paracentesis may possibly be required.

IV. PNEUMOTHORAX.—HYDRO-PNEUMOTHORAX.

ÆTIOLOGY.—1. Pneumothorax of any clinical importance results in the great majority of cases from *perforation of the lung*, owing to the rupture of a phthisical cavity. In very rare cases the lung gives way in the earlier stages of phthisis, or in connection with emphysema, abscess, gangrene, hydatids, or cancer; or the vesicles may rupture from violent cough, especially hooping-cough; or a collection of air or blood under the pleura may perforate the latter. 2. Perforation may take place *from the pleura into the lung*, in connection with empyæma or abscess of the chest-walls. 3. *Injury* may lead to pneumothorax, viz., direct perforation from without, laceration by fractured ribs, or severe contusion. 4. The *stomach* or *œsophagus* has in very rare instances ruptured into the pleura. It is unnecessary to consider those cases in which gas is present from the decomposition of fluid.

ANATOMICAL CHARACTERS.—The gas in the pleura generally consists of oxygen, carbonic anhydride, and nitrogen in variable proportions; with, under some circumstances, fœtid ingredients, such as sulphuretted hydrogen. It may fill the pleural sac completely, compressing the lung; or is sometimes limited by adhesions. The gas tends to excite inflammation, the resulting effusion being either serous or purulent.

SYMPTOMS.—It is only necessary to consider here those symptoms which are indicative of *perforative pneumothorax.* Usually a sudden, very intense pain in the side is experienced; as well as occasionally a sensation of something giving way, and of fluid pouring out; followed by urgent dyspnœa, and signs of shock. These symptoms frequently immediately follow a violent cough. The dyspnœa may temporarily diminish, or it steadily increases in proportion to the amount of air accumulated, until constant or paroxysmal orthopnœa is established. The voice becomes feeble, in some cases to complete aphonia. Cough is often rendered difficult and ineffectual, and expectoration ceases. Occasionally there is much hyperæsthesia of the side. The pulse is frequent, weak, and small, but breathing being hurried out of proportion, the pulse-respiration ratio is altered. The patient generally presents an anxious and distressed aspect, and soon evidences of apnœa are apparent. A common mode of decumbency at first is dorsal, with the head raised, and the body inclined to the sound side; or the patient may assume a kneeling posture, supported on the elbows. In many cases the posture is changed frequently, and when fluid collects there is a tendency to lie on the affected side.

It must be borne in mind that even in severe cases of pneumothorax the symptoms may be by no means marked; and when the escape of air is limited by adhesions, they are usually comparatively slight.

PHYSICAL SIGNS.—The amount of air accumulated; the presence and quantity of fluid mixed with it; and the patency or closure, as well as the size, of the perforation into the lung, will modify the *physical signs* of pneumothorax. 1. The side is *enlarged*, often to an extreme degree, the intercostal spaces being widened and effaced or even bulged out, so that the surface of the chest feels smooth. 2. *Movements* are deficient or annulled. 3. *Vocal fremitus* is weak or absent. 4. *Percussion* reveals at first increased resonance, the sound being often typically tympanitic, and this may be noticed considerably across the middle line. Sometimes it has an amphoric quality. If the amount of air is extreme, there is dulness with much resistance. When effusion of fluid takes place, dulness will be observed in dependent parts, movable with change of posture usually. Occasionally at the line of junction of fluid and air an amphoric note can be elicited, and a quivering sensation is felt by the fingers. 5. *Respiration-sounds* may be weak and distant, or almost suppressed;

typically amphoric when the fistula is open, with a metallic echo; or alternately one or the other. A whistling inspiration is heard in rare instances, due to the passage of air through a narrow chink into the pleura. 6. *Vocal resonance* may be feeble or absent; or exaggerated, with a metallic or amphoric echo; while the whisper in some cases is very loud, and has a marked metallic or amphoric character. 7. *Cough* may also have a metallic echo. 8. *Metallic tinkling* is sometimes distinctly produced by breathing, coughing, or speaking; and the *bell-sound* may be elicited. 9. *Succussion* gives rise to a splashing sensation and sound, if both air and fluid are present in the pleural cavity. 10. Displacement of the mediastinum, heart, diaphragm, and abdominal organs is observed to a variable degree. 11. The *heart-sounds* are now and then intensified on the affected side, and attended with a metallic echo.

Prognosis.—Though a very grave event, pneumothorax is not necessarily fatal, recovery occasionally taking place. It is less dangerous when localized. In some instances where pneumothorax has occurred in connection with phthisis, it seems to have delayed the progress of the lung-disease.

Treatment.—I have obtained great relief in some cases from strapping the side firmly, as described under pleurisy. If the amount of air is considerable, causing urgent dyspnœa, paracentesis must be performed, and pressure may be afterwards applied. Dry cupping of the chest is sometimes useful. Stimulants and antispasmodics should be given to counteract shock and dyspnœa. Dr. Walshe recommends repeated inhalations of small quantities of *chloroform*. Pleurisy must be treated should it arise.

Chapter XVII.

GENERAL DIAGNOSIS OF AFFECTIONS OF THE LUNGS AND PLEURÆ.

In this chapter it is intended to bring together the chief pulmonary diseases which resemble each other, and to point out their diagnostic marks. In many cases they can only be severally distinguished by a full consideration of the history of the patient; the local and general symptoms; and the physical signs present.

1. Acute Pulmonary Affections.—The characteristic features of the principal diseases belonging to this group are indicated in the following table:—

Diagnostic Table of Acute Pulmonary Diseases.

	Bronchitis.	Croupous Pneumonia.	Catarrhal Pneumonia.	Pleurisy.	Acute Phthisis
1. Mode of invasion.	Coryza and other symptoms of "cold." Not marked rigors, but only slight and repeated chills, if any.	A single, severe, prolonged rigor at the outset usually.	Generally occurs after bronchitis or collapse, and without distinct rigors.	Several moderate rigors or slight chills, if any. Invasion may be very insidious.	Follows acute pneumonia, bronchitis, or catarrhal pneumonia; or begins with severe rigors, often repeated

	BRONCHITIS.	CROUPOUS PNEUMONIA.	CATARRHAL PNEUMONIA.	PLEURISY.	ACUTE PHTHISIS
2. Sensations about the chest.	Soreness, heat, or rawness behind the sternum. Muscular pains from cough. Feeling of oppression.	Pain in the side frequently, not stitch-like, but more dull and diffused.	Pains about the chest often, but not specially localized.	Severe stitch-like pain in side.	Generally pains in various parts of the chest.
3. Cough.	In paroxysms, often severe.	Considerable, and in paroxysms.	Short, hacking, and painful.	Slight, and patient tries to repress it.	Frequent and violent fits.
4. Expectoration.	Abundant; changes its characters as the case progresses from mucous to muco-purulent, &c.	Considerable; viscid, tenacious, and "rusty."	Often less than before: not "rusty."	Absent or very slight, and of no special characters.	Abundant; either bronchitic, or sometimes "rusty," or attended with hæmoptysis.
5. Disturbance of breathing.	Sense of dyspnœa in proportion to the extent of the disease; may be extreme. Pulse-respiration ratio not proportionately altered.	Very rapid breathing, and much perversion of pulse-respiration ratio, but not proportionate feeling of dyspnœa.	Rapidity of breathing increased when the complaint follows bronchitis; but feeling of dyspnœa may be less.	Quick shallow breathing at first, but less disturbance of pulse-respiration ratio than in pneumonia. Later on more or less actual dyspnœa.	Great dyspnœa, and very hurried breathing, especially in the tubercular form.
6. Degree of pyrexia.	Often absent or slight, and temperature rarely above 100° to 102°. Skin moist.	Considerable; temperature usually high, 103,° 104°, 105°, or more, and runs a regular course. Skin acridly hot and dry.	Temperature high, but there are considerable remissions, at irregular intervals.	Not great, and no regularity in course of temperature. Skin not acridly hot.	Often very high, especially in the tubercular form, but no regularity in temperature.
7. Aspect of the patient, and general condition.	Tendency to cyanosis if the disease is extensive. In some cases adynamic symptoms set in.	Marked flushing of face, often unilateral. Not cyanotic. Usually great prostration.	Face is usually flushed. Often much anxiety and restlessness, with loss of flesh and strength.	Nothing special. No particular prostration, or tendency to cyanosis.	Severe prostration and weakness, with profuse perspiration, and rapid wasting. In the tubercular form extreme adynamia.
8. Physical signs.	Various dry and mucous râles and rhonchal fremitus. Signs of obstruction of bronchial tubes in some cases. More or less bilateral. Mucous râles chiefly towards bases; dry rhonchi at upper part of chest.	At first crepitant rhonchus: followed by signs of consolidation viz., diminished movement; increased vocal fremitus; dulness; bronchial or tubular breathing; increased and metallic vocal resonance: finally signs of resolution. Usually one base is affected. The side is not notably enlarged; nor is there any displacement of organs.	There may be signs of consolidation, in scattered spots, with râles. Both lungs are usually involved in irregularly scattered patches. When the disease follows extensive pulmonary collapse, there may be a peculiar pyramidal form of dulness.	At first friction-sound or fremitus: succeeded by signs of fluid, viz., side often enlarged; movements interfered with; diminished vocal fremitus; dulness; occasionally movable; weak or suppressed breathing and vocal resonance; œgophony sometimes; and displacement of organs: finally, signs of absorption, with redux friction sound or fremitus. Usually on one side.	At first merely signs of bronchitis, followed by consolidation, softening, or excavations in different parts, especially towards the bases. In the tubercular form frequently scattered râles constitute the only physical signs.
9. Course and termination.	Variable. No crisis. Tendency to death by apnœa or adynamia in capillary bronchitis.	Often a marked crisis, and disease ends within a certain period.	No crisis, and course often prolonged.	No crisis, and course very variable.	Generally very rapid course, and fatal termination.

It is impossible in an arrangement like the preceding to do more than indicate in a general way the main differences between the ordinary pulmonary diseases. It must be remembered that non-typical cases are met with; and also that these affections are often presented in various combinations. Usually the chief matters as regards diagnosis are to distinguish bronchitis from pneumonia, especially catarrhal pneumonia complicating bronchitis; basic pneumonia from pleuritic effusion; acute phthisis from either form of pneumonia or from extensive bronchitis; and the different varieties of acute phthisis from each other.

The diagnosis of *pulmonary congestion* and its consequences, as well as of *abscess* and *gangrene*, have been sufficiently indicated in the descriptions of these morbid conditions. It is often difficult to diagnose between mere *lobular collapse* and *lobular pneumonia*, but the thermometer will afford important aid in distinguishing these conditions from each other.

2. Occasionally a case comes under observation where *one side is enlarged*, and there is a doubt as to whether the physical signs are due to *fluid*, or to very extensive *solid accumulation*, especially *secondary cancer* of the lung. Under such circumstances, the diagnosis must be founded on:—*a*. The history of the case. *b*. Certain physical signs, viz., in consolidation the chest is uneven on its surface; there is no fluctuation, but a marked sense of resistance is experienced on percussion: as a rule also bronchial breathing is heard, with increased vocal resonance and conduction of the heart-sounds, though there may be complete absence of breath sounds and voice, except perhaps in certain spots, such as close to the spine. *c*. The symptoms present, and the general condition. In consolidation pressure-symptoms are frequently noticed; there is more severe cough, with expectoration; and the sputa may have special characters, hæmoptysis being also not uncommon. Should there be any actual uncertainty as to the diagnosis, recourse must be had to the employment of the aspirateur or of a small exploratory suction-trochar, by means of which some of the fluid, if present, may be removed for examination, and no damage is done if there is none.

3. There are certain conditions in which signs of *increase of air* within the chest are observed, viz., *emphysema; hypertrophy of the lungs;* and *pneumothorax*. There may be some difficulty in separating the two former, and they are often more or less associated. *Hypertrophy* is generally unilateral, following some affection which evidently interferes with the action of the opposite lung; while the breath-sounds are simply exaggerated; and there are no symptoms. *Emphysema* is usually bilateral; expiration and the accompanying sound are much prolonged; dry râles are often heard; and there is characteristic dyspnœa. The mode and conditions of onset; severity and nature of the symptoms; almost invariably unilateral character; great enlargement of side, with typical tympanitic percussion sound, amphoric breathing, and other physical signs, render the diagnosis of *pneumothorax* from the other affections mentioned perfectly easy as a rule.

4. Perhaps as difficult a matter as any in the diagnosis of lung-affections is to distinguish between certain morbid conditions which are attended with *retraction of one side*, viz., *chronic interstitial pneumonia;* retraction after *pleurisy;* certain cases of ordinary *phthisis; collapse of the lung;* and *infiltrated cancer*. It will be only practicable here to indicate the main points to be taken into consideration, which are :—*a*. The previous and family history of the patient in all its details; and the duration of the illness. *b*. The nature of the local symptoms, special attention being paid to the presence and character of pain; and to the nature of the sputa, which should be carefully examined, the occurrence of hæmoptysis, and the characters of any blood expectorated, being points of much importance. *c*. The constitutional and general condition, as indicating tuberculosis or cancer, emaciation, debility, or pyrexia. *d*. The presence of signs of tubercle or cancer in other parts. *e*. The physical signs noted, including their characters; their seat, as to the part of the lung affected, and whether one or both; and their extent. *Chronic pneumonia, cancer,* and *phthisis* are often attended with signs of cavities, these being in the last affection usually most marked at the apex, but not so in the others. In cancer dulness frequently extends across the middle line. It is important to examine thoroughly with the view of ascertaining whether a tumour is present in the chest, which might, by pressing upon a bronchus, lead to collapse; and also to look for other signs of pressure, which are generally associated with cancer. *f*. The progress and duration of the case, which will usually help considerably when there is any obscurity.

5. Sometimes there is a difficulty in distinguishing between *chronic bronchitis* and *phthisis*, when the former is attended with profuse purulent expectoration, and with general wasting. The slow progress and comparatively slight degree of emaciation; absence of fever; non-occurrence of hæmoptysis; and absence of physical signs of consolidation followed by cavities, will serve to characterize mere bronchitis in the majority of cases, but it must be borne in mind that this complaint frequently terminates in phthisis. For the diagnosis of the different forms of phthisis from each other, which is often difficult, reference must be made to what has been stated when alluding to its varieties.

6. It may be necessary to determine the nature of any *fluid in the pleura*, and the cause of its presence; and here it may be mentioned that fluid in rare instances finds its way from the abdomen, as from the bursting of an abscess of the liver or kidney through the diaphragm. There will then have been previous symptoms indicative of either of these conditions. With regard to the determination of the *nature of the fluid* in cases of *pleuritic effusion after inflammation*, it is impossible to come to any positive conclusion without making use of the aspirateur or exploring trochar, and obtaining some of it for examination. In children, however, if the fluid has remained in the pleura for some weeks, it will probably be of a purulent character. Mere *hydrothorax* is distinguished from *inflammatory effusion* by the following characters :—*a*. It is usually a part of general dropsy. *b*. Fluid is found on both sides, but not in excessive quantity; it accumulates

in the lower part of the pleuræ, pushing down the diaphragm, but not displacing the mediastinum and heart as a rule; and it is freely movable. *c.* There are no friction-phenomena. *d.* Pain and tenderness are absent; but dyspnœa is generally very severe. *e.* There is no pyrexia. *Hæmothorax* is characterized by the circumstances under which it occurs; and the signs of loss of blood. If there is any uncertainty in the diagnosis, the aspirateur should be employed.

7. It must be mentioned that symptoms and physical signs may be observed in connection with the lungs, which are due to certain morbid conditions not originally associated with these organs, such as rupture of a hydatid tumour of the liver or of an hepatic abscess into the lung; a hernia of the stomach through the diaphragm; and other exceptional lesions.